

SCIENCE

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FOR THE ADVANCEMENT OF SCIENCE.

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CONTENTS:

<i>The Meeting of the American Society of Naturalists in Chicago during Convocation Week.....</i>	905
<i>Extract from President's Roosevelt's Message to the Congress</i>	907
<i>The American Association for the Advancement of Science:—</i>	
<i>Section I, Social and Economic Science: DR. RAYMOND A. PEARSON.....</i>	912
<i>American Ornithologists' Union: JOHN H. SAGE.....</i>	926
<i>Joseph Hirsch: PROFESSOR R. H. THURSTON.....</i>	927
<i>Scientific Books:—</i>	
<i>Rabot on Glaciers; DR. HARRY FIELDING REID. Johnston on the Brain of Acipenser: PROFESSOR C. JUDSON HERRICK. The Smithsonian Institution: H. C. B. Remsen's Chemistry: PROFESSOR W. A. NOYES.....</i>	928
<i>Scientific Journals and Articles.....</i>	932
<i>Societies and Academies:—</i>	
<i>Calendar; N. Y. Academy of Sciences: Section of Astronomy, Physics and Chemistry: DR. F. L. TUFTS. Section of Anthropology and Psychology: DR. R. S. WOODWORTH. The Torrey Botanical Club: PROFESSOR E. S. BURGESS. The Anthropological Society of Washington: W. HOUGH... </i>	933
<i>Discussion and Correspondence:—</i>	
<i>The Geographical Distribution of Fishes: PRESIDENT D. S. JORDAN. Preglacial Drainage in Southwestern Ohio: GERARD FOWKE. The Senegal Baobab Tree: DR. C. A. WHITE</i>	936
<i>Shorter Articles:—</i>	
<i>The Largest Deep-Sea Fish: DR. THEO. GILL and DR. C. H. TOWNSEND.....</i>	937
<i>Current Notes on Meteorology:—</i>	
<i>Hail Prevention by Cannonading; The Dust-storm of March, 1901, and Glacial Studies; The Climatic Control of Government in the Tropics; Underground Temperatures at Oxford: PROFESSOR R. DEC. WARD.....</i>	938
<i>Botanical Notes:—</i>	
<i>Important Philippine Woods; Recent Ecological Papers; Government Grass Studies: PROFESSOR CHARLES E. BESSEY.....</i>	938
<i>The South African Museum: F. A. L.....</i>	940
<i>Scientific Notes and News.....</i>	940
<i>University and Educational News.....</i>	943

THE MEETING OF THE AMERICAN SOCIETY OF NATURALISTS IN CHICAGO DURING CONVOCATION WEEK.

FOR the first time in its history the American Society of Naturalists, together with various affiliated societies, will hold its annual meeting in Chicago as guests of the University of Chicago during the week beginning December 30. A cordial invitation has been extended to the several societies by the Naturalists of the Interior and there is every reason to anticipate a large and successful meeting. It is greatly to be desired that naturalists in the east shall make a special effort to attend this meeting, as it is not likely that meetings of the American Society of Naturalists will often be held at a point so distant from the coast.

The American Society of Naturalists of late years has become chiefly a nucleus around which various affiliated societies of a more or less technical character are gathered, and the functions of the parent society have been reduced, to put the matter epigrammatically, to a discussion and a dinner. Those who have watched its progress most carefully believe that this evolution has been natural and logical. The time has clearly gone by when specialists

can be expected to listen with patience or with profit to the technical discussions of other specialists. But at the same time, as all biologists, at least, must recognize, differentiation with its inherent drawbacks must be corrected by some sort of careful cooperation of dissimilars, and it would appear that here, as in the bodies of living organisms coordination, though perhaps less conspicuous than the work of the specialized parts, is even more important.

The 'discussion,' which has become one of the two important features of the work of the Naturalists, has in the past generally proved useful and interesting. The subject chosen for this year is in no wise inferior to those of earlier years, namely, 'The Relation of the American Society of Naturalists to other Scientific Societies,' and it is likely that the whole subject of convocation week, winter meetings *versus* summer meetings, the proper function of the American Association for the Advancement of Science, and similar subjects of vital importance to the organization of American science in the future, will be thoroughly threshed out.

Hardly less important than the discussion is the 'dinner,' at which all members of all the affiliated societies should have an opportunity of becoming acquainted. It is greatly to be hoped that the *ménu* this year will be made simple and short and the service prompt, in order to allow time afterwards for making acquaintances, 'talking shop,' comparing notes, and the like. By fortunate custom all ordinary after-dinner speaking has been done away with, and in its stead with the sole accom-

paniment of coffee and cigars the president's address is given. This perhaps should be accounted the third feature of importance of the meeting of the Naturalists, and it ought to be distinctly understood that the president's address should not deal with technicalities within his own specialty but with some large subject of general interest or importance, if possible, to all naturalists and men of science. We are glad to observe that the address of the President for the current year seems likely to be of this character, the topic announced being the 'Modern Subjection of Science and Education to Propaganda.'

There is a strong feeling on the part of many men of science in America that summer scientific meetings ought to be given up, or at all events subordinated to a great winter meeting. It is argued that it is too much to expect of anyone who is comfortably resting or working in the mountains or by the sea that he shall expose himself to the fatigues and depression of tropical railroading, and the sometimes blistering heat of cities, in order to read or listen to scientific papers. A wise adaptation to the environment—when we cannot modify it—is a fundamental law of life, and it is urged with much force that the rapid growth in favor of winter meetings is simply a natural and inevitable adaptation of this kind to the environment. As our readers know, a large majority of the leading American universities and colleges have, at the instance of the American Association for the Advancement of Science, decided to set aside for the meetings of scientific and learned societies the week in which the first of January

falls. The meetings at Chicago of the Council of the American Association for the Advancement of Science and of the American Society of Naturalists and affiliated societies consequently mark the establishment of convocation week. This fact alone should make the approaching meeting one of unusual importance, and we desire once more to urge upon all naturalists who can possibly do so, and especially those in the east, the duty as well as the privilege of attending the Chicago meeting.

*EXTRACTS FROM PRESIDENT ROOSEVELT'S
MESSAGE TO THE CONGRESS.*

A SECRETARY OF COMMERCE AND
INDUSTRIES.

THERE should be created a cabinet officer, to be known as secretary of commerce and industries, as provided in the bill introduced at the last session of the Congress. It should be his province to deal with commerce in its broadest sense, including among many other things whatever concerns labor and all matters affecting the great business corporations and our merchant marine. The course proposed is one phase of what should be a comprehensive and far-reaching scheme of constructive statesmanship for the purpose of broadening our markets, securing our business interests on a safe basis, and making firm our new position in the international industrial world; while scrupulously safeguarding the rights of wage-worker and capitalist, of investor and private citizen, so as to secure equity as between man and man in this republic.

THE PACIFIC CABLE.

I call your attention most earnestly to the crying need of the cable to Hawaii and the Philippines, to be continued from the Philippines to points in Asia. We should

not defer a day longer than necessary the construction of such a cable. It is demanded not merely for commercial but for political and military considerations. Either the Congress should immediately provide for the construction of a Government cable, or else an arrangement should be made by which like advantages to those accruing from a Government cable may be secured to the Government by contract with a private cable company.

THE ISTHMIAN CANAL TREATY.

No single great material work which remains to be undertaken on this continent is of such consequence to the American people as the building of a canal across the Isthmus connecting North and South America. Its importance to the nation is by no means limited merely to its material effects upon our business prosperity; and yet with a view to these effects alone it would be to the last degree important for us immediately to begin it. While its beneficial effects would perhaps be most marked upon the Pacific coast and the Gulf and south Atlantic States, it would also greatly benefit other sections. It is emphatically a work which it is for the interest of the entire country to begin and complete as soon as possible; it is one of those great works which only a great nation can undertake with prospects of success, and which, when done, are not only permanent assets in the nation's material interests, but standing monuments to its constructive ability.

THE SMITHSONIAN INSTITUTION.

The advancement of the highest interests of national science and learning and the custody of objects of art and of the valuable results of scientific expeditions conducted by the United States have been committed to the Smithsonian Institution. In furtherance of its declared purpose—for the 'increase and diffusion of knowledge

among men'—the Congress has from time to time given it other important functions. Such trusts have been executed by the institution with notable fidelity. There should be no halt in the work of the institution, in accordance with the plans which its secretary has presented, for the preservation of the vanishing races of great North American animals in the National Zoological Park. The urgent needs of the National Museum are recommended to the favorable consideration of the Congress.

THE LIBRARY OF CONGRESS.

Perhaps the most characteristic educational movement of the past fifty years is that which has created the modern public library and developed it into broad and active service. There are now over five thousand public libraries in the United States, the product of this period. In addition to accumulating material, they are also striving, by organization, by improvement in method and by cooperation, to give greater efficiency to the material they hold, to make it more widely useful, and by avoidance of unnecessary duplication in process to reduce the cost of its administration. In these efforts they naturally look for assistance to the Federal Library, which, though still the Library of Congress, and so entitled, is the one national library of the United States. Already the largest single collection of books on the Western Hemisphere, and certain to increase more rapidly than any other through purchase, exchange and the operation of the copyright law, this library has a unique opportunity to render to the libraries of this country—to American scholarship—service of the highest importance. It is housed in a building which is the largest and most magnificent yet erected for library uses. Resources are now being provided which will develop the collection properly, equip it with apparatus and ser-

vice necessary to its effective use, render its bibliographic work widely available, and enable it to become not merely a center of research, but the chief factor in great cooperative efforts for the diffusion of knowledge and the advancement of learning.

A PERMANENT CENSUS BUREAU.

For the sake of good administration, sound economy and the advancement of science, the Census Office as now constituted should be made a permanent Government bureau. This would insure better, cheaper and more satisfactory work, in the interest not only of our business, but of statistic, economic and social science.

THE DEPARTMENT OF AGRICULTURE, FORESTRY AND IRRIGATION.

The Department of Agriculture during the past fifteen years has steadily broadened its work on economic lines, and has accomplished results of real value in upbuilding domestic and foreign trade. It has gone into new fields until it is now in touch with all sections of our country and with two of the island groups that have lately come under our jurisdiction, whose people must look to agriculture as a livelihood. It is searching the world for grains, grasses, fruits and vegetables specially fitted for introduction into localities in the several states and territories where they may add materially to our resources. By scientific attention to soil survey and possible new crops, to breeding of new varieties of plants, to experimental shipments, to animal industry and applied chemistry, very practical aid has been given our farming and stock-growing interests. The products of the farm have taken an unprecedented place in our export trade during the year that has just closed.

Public opinion throughout the United States has moved steadily toward a just appreciation of the value of forests, whether

planted or of natural growth. The great part played by them in the creation and maintenance of the national wealth is now more fully realized than ever before. Wise forest protection does not mean the withdrawal of forest resources, whether of wood, water or grass, from contributing their full share to the welfare of the people, but, on the contrary, gives the assurance of larger and more certain supplies. The fundamental idea of forestry is the perpetuation of forests by use. Forest protection is not an end of itself; it is a means to increase and sustain the resources of our country and the industries which depend upon them. The preservation of our forests is an imperative business necessity. We have come to see clearly that whatever destroys the forest, except to make way for agriculture, threatens our well-being.

The practical usefulness of the national forest reserves to the mining, grazing, irrigation and other interests of the regions in which the reserves lie has led to a widespread demand by the people of the West for their protection and extension. The forest reserves will inevitably be of still greater use in the future than in the past. Additions should be made to them whenever practicable, and their usefulness should be increased by a thoroughly businesslike management. At present the protection of the forest reserves rests with the General Land Office, the mapping and description of their timber with the United State Geological Survey, and the preparation of plans for their conservative use with the Bureau of Forestry, which is also charged with the general advancement of practical forestry in the United States. These various functions should be united in the Bureau of Forestry, to which they properly belong. The present diffusion of responsibility is bad from every standpoint. It prevents that effective cooperation between the Government and the men who utilize the resources

of the reserves without which the interests of both must suffer. The scientific bureaus generally should be put under the Department of Agriculture. The President should have by law the power of transferring lands for use as forest reserves to the Department of Agriculture. He already has such power in the case of lands needed by the Departments of War and the Navy.

The wise administration of the forest reserves will be not less helpful to the interests which depend on water than to those which depend on wood and grass. The water supply itself depends upon the forest. In the arid region it is water, not land, which measures production. The western half of the United States would sustain a population greater than that of the whole country to-day if the waters that now run to waste were saved and used for irrigation. The forest and water problems are perhaps the most vital internal questions of the United States.

Certain of the forest reserves should also be made preserves for the wild forest creatures. All the reserves should be better protected from fires. Many of them need special protection because of the great injury done by live stock, above all by sheep. The increase in deer, elk and other animals in the Yellowstone Park shows what may be expected when other mountain forests are properly protected by law and properly guarded. Some of these areas have been so denuded of surface vegetation by overgrazing that the ground breeding birds, including grouse and quail, and many mammals, including deer, have been exterminated or driven away. At the same time the water-storing capacity of the surface has been decreased or destroyed, thus promoting floods in times of rain and diminishing the flow of streams between rains.

In cases where natural conditions have been restored for a few years, vegetation

has again carpeted the ground, birds and deer are coming back, and hundreds of persons, especially from the immediate neighborhood, come each summer to enjoy the privilege of camping. Some at least of the forest reserves should afford perpetual protection to the native fauna and flora, safe havens of refuge to our rapidly diminishing wild animals of the larger kinds, and free camping grounds for the ever-increasing numbers of men and women who have learned to find rest, health and recreation in the splendid forests and flower-clad meadows of our mountains. The forest reserves should be set apart forever for the use and benefit of our people as a whole, and not sacrificed to the short-sighted greed of a few.

The forests are natural reservoirs. By restraining the streams in flood and replenishing them in drought they make possible the use of waters otherwise wasted. They prevent the soil from washing, and so protect the storage reservoirs from filling up with silt. Forest conservation is therefore an essential condition of water conservation. The forests alone cannot, however, fully regulate and conserve the waters of the arid region. Great storage works are necessary to equalize the flow of streams and to save the flood waters. Their construction has been conclusively shown to be an undertaking too vast for private effort. Nor can it be best accomplished by the individual states acting alone. Far-reaching interstate problems are involved; and the resources of single states would often be inadequate. It is properly a national function, at least in some of its features. It is as right for the National Government to make the streams and rivers of the arid region useful by engineering works for water storage as to make useful the rivers and harbors of the humid region by engineering works of another kind. The storing of the floods in

reservoirs at the headwaters of our rivers is but an enlargement of our present policy of river control, under which levees are built on the lower reaches of the same streams.

The Government should construct and maintain these reservoirs, as it does other public works. Where their purpose is to regulate the flow of streams, the water should be turned freely into the channels in the dry season to take the same course under the same laws as the natural flow. The reclamation of the unsettled arid public lands presents a different problem. Here it is not enough to regulate the flow of streams. The object of the government is to dispose of the land to settlers who will build homes upon it. To accomplish this object water must be brought within their reach. The pioneer settlers on the arid public domain chose their homes along streams from which they could divert the water to reclaim their holdings. Such opportunities are practically gone. There remain, however, vast areas of public land which can be made available for homestead settlement, but only by reservoirs and main-line canals impracticable for private enterprise. These irrigation works should be built by the National Government. The lands reclaimed by them should be reserved by the Government for actual settlers, and the cost of construction should so far as possible be repaid by the land reclaimed. The distribution of the water, the division of the streams among irrigators, should be left to the settlers themselves in conformity with state laws and without interference with those laws or with vested rights. The policy of the National Government should be to aid irrigation in the several states and territories in such manner as will enable the people in the local communities to help themselves, and as will stimulate needed reforms in the state laws and regulations governing irrigation.

The reclamation and settlement of the arid lands will enrich every portion of our country, just as the settlement of the Ohio and Mississippi valleys brought prosperity to the Atlantic States. The increased demand for manufactured articles will stimulate industrial production, while wider home markets and the trade of Asia will consume the larger food supplies and effectually prevent western competition with eastern agriculture. Indeed, the products of irrigation will be consumed chiefly in upbuilding local centers of mining and other industries, which would otherwise not come into existence at all. Our people as a whole will profit, for successful homemaking is but another name for the upbuilding of the nation.

The necessary foundation has already been laid for the inauguration of the policy just described. It would be unwise to begin by doing too much, for a great deal will doubtless be learned, both as to what can and what cannot be safely attempted by the early efforts, which must of necessity be partly experimental in character. At the very beginning the Government should make clear, beyond shadow of doubt, its intention to pursue this policy on lines of the broadest public interest. No reservoir or canal should ever be built to satisfy selfish personal or local interests; but only in accordance with the advice of trained experts, after long investigation has shown the locality where all the conditions combine to make the work most needed and fraught with the greatest usefulness to the community as a whole. There should be no extravagance, and the believers in the need of irrigation will most benefit their cause by seeing to it that it is free from the least taint of excessive or reckless expenditure of the public moneys.

Whatever the nation does for the extension of irrigation should harmonize with, and tend to improve, the condition of those

now living on irrigated land. We are not at the starting point of this development. Over two hundred millions of private capital has already been expended in the construction of irrigation works, and many million acres of arid land reclaimed. A high degree of enterprise and ability has been shown in the work itself; but as much cannot be said in reference to the laws relating thereto. The security and value of the homes created depend largely on the stability of titles to water; but the majority of these rest on the uncertain foundation of court decisions rendered in ordinary suits at law. With a few creditable exceptions, the arid states have failed to provide for the certain and just division of streams in times of scarcity. Lax and uncertain laws have made it possible to establish rights to water in excess of actual uses or necessities, and many streams have already passed into private ownership, or a control equivalent to ownership.

Whoever controls a stream practically controls the land it renders productive, and the doctrine of private ownership of water apart from land cannot prevail without causing enduring wrong. The recognition of such ownership, which has been permitted to grow up in the arid regions, should give way to a more enlightened and larger recognition of the rights of the public in the control and disposal of the public water supplies. Laws founded upon conditions obtaining in humid regions, where water is too abundant to justify hoarding it, have no proper application in a dry country. In the arid states the only right to water which should be recognized is that of use. In irrigation this right should attach to the land reclaimed and be inseparable therefrom. Granting perpetual water rights to others than users, without compensation to the public, is open to all the objections which apply to giving away perpetual franchises to the public

utilities of cities. A few of the Western states have already recognized this, and have incorporated in their constitution the doctrine of perpetual state ownership of water.

The benefits which have followed the unaided development of the past justify the nation's aid and cooperation in the more difficult and important work yet to be accomplished. Laws so vitally affecting homes as those which control the water supply will only be effective when they have the sanction of the irrigators; reforms can only be final and satisfactory when they come through the enlightenment of the people most concerned. The larger development which national aid insures should, however, awaken in every arid state the determination to make its irrigation system equal in justice and effectiveness that of any country in the civilized world. Nothing could be more unwise than for isolated communities to continue to learn everything experimentally, instead of profiting by what is already known elsewhere. We are dealing with a new and momentous question, in the pregnant years while institutions are forming, and what we do will affect not only the present, but future generations.

Our aim should be not simply to reclaim the largest area of land and provide homes for the largest number of people, but to create for this new industry the best possible social and industrial conditions; and this requires that we not only understand the existing situation, but avail ourselves of the best experience of the time in the solution of its problems. A careful study should be made, both by the nation and the States, of the irrigation laws and conditions here and abroad. Ultimately it will probably be necessary for the nation to cooperate with the several arid states in proportion as these states by their legislation and administration show themselves fit to receive it.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SECTION I, SOCIAL AND ECONOMIC SCIENCE.

OFFICERS for the Denver meeting were: *Vice-President*, John Hyde; *Secretary*, Raymond A. Pearson; *Member of Council*, E. T. Peters; *Sectional Committee*, C. M. Woodward, H. T. Newcomb, John Hyde, R. A. Pearson, Marcus Benjamin, F. R. Rutter and L. F. Schmeckebier; *Member of the General Committee*, F. H. Hitchcock.

Nine meetings were held and at each a full program was presented. Unusual interest in some papers was shown by the discussions. The average attendance was probably the largest in the history of the Section. The majority of papers treated of subjects which are of special interest in the West—one entire day, including an evening session, being given to the consideration of the economic and social aspects of irrigation.

The vice-presidential address of Professor C. M. Woodward, 'The Change of Front in Education,' was published in full in a recent number of SCIENCE. Other papers were as follows:

'Scientific Men of Colorado': DR. MARCUS BENJAMIN, Washington, D. C.

This paper had for its purpose the presentation to the Section of the records of various scientific men of Colorado, and consisted chiefly of summaries of the excellent work done by the graduates of the Scientific Department of Columbia University, formerly known as the School of Mines, towards the development of the mineral resources of Colorado, as well as of the improved methods in metallurgical science invented by them. The sketches were some twenty in number and included the careers of such men as M. W. Iles, M. C. Ihlseny, W. B. Devereux, H. V. Furman and Richard Pearce. Brief mention was also made of such scientists as the late Senator N. P. Hill, who was referred to as the only chemist ever elected to the United States

Senate ; Regis Chauvenet (a son of W. M. Chauvenet, who was president of the Association in 1870), president of the Colorado School of Mines, and others who have taken a conspicuous part in the development of scientific thought in Colorado. The paper closed with a brief appeal for the preservation in a suitable building of the remains of the former inhabitants of Colorado and the Southwest.

'Dangers from Inaccuracy in Presentation of Transportation Problems': JAMES H. BLODGETT, A.M. Division of Statistics, Department of Agriculture, Washington, D. C.

Projects for transportation of water, both for personal use and for irrigation of crops, are necessary on a scale requiring municipal or corporate association of effort. In transportation of food and other commodities the railroad and the steamship form the present culmination of carriers. Water-works for cities, or for agriculture, canal and ship enterprises call for government aid. Railroads once largely aided by public appropriations depend mainly on sales of bonds and stocks to investors. In some propositions to the public, error is combined with truth to a dangerous extent. Two groups of erroneous statements are now particularly prominent, even in school books, in regard to interior waterways: One relates to a presumed project for a ship canal between the Black and the Baltic seas, officially disclaimed by Russia; another as to interior waterways between Boston and Galveston, really no more than three feet deep in the shallowest part, and between the mouths of the St. Lawrence and the Mississippi, no more than six feet deep for long distances, with short narrow locks. The Chicago Drainage Canal has as yet no commercial relations. The limit of urban population is liable to be determined by the water supply. The extent of cultivation upon Western plains is already limited by

the availability of water. It is a question whether taxation does not tend to increase faster than average incomes or than market values of property. Municipal repudiation ought to be unknown. Many municipalities have reached the legal limits of taxation and of indebtedness, but under popular demand constitutions have been amended and new municipal organizations have been superimposed to place additional taxes on the property. In Illinois, for example, most of the following series of taxes may represent separate authorities levying independently.

(a) National, (b) state, (c) county, (d) township, (e) school district, (f) city, incorporated town, village, in addition to school tax, (g) township high-school district, (h) drainage district, (i) sanitary district, (k) townships or road districts, for hard roads.

Most of these separate agencies can incur debt not to exceed five per cent. of the valuation, making possible a very large aggregate obligation resting upon the taxable property. Township high-schools, drainage districts, sanitary districts, hard-road districts, are not numerous, but they are possible in any part of the State under general laws.

'The Census of Cuba': VICTOR H. OLMSTED, Assistant Director of the Census of Cuba.

The prospective establishment of an independent government in Cuba made information necessary concerning the numbers and distribution, the education, the racial divisions, etc., of its population. The American authorities, after deliberate consultation with eminent Cubans, decided upon a census of the island. The knowledge already had of the temperament of the people, and of the probable obstacles to speedy work, indicated that conditions in Cuba were unfavorable to census-taking on a scale so comprehensive as that of the United

States; hence only the more important data concerning population, education and agriculture were collected. The work was intrusted chiefly to Cubans. The prevailing idea was that the census was to be of Cubans, by Cubans and for Cubans, and that its successful accomplishment would indicate their capacity for the subsequent establishment and maintenance of civil government. This decision was enthusiastically received by Cuban press and public. President McKinley's proclamation, August 17, 1899, declaring the census a preliminary step towards the establishment of self-government, completed the obliteration of all suspicion of American motives theretofore prevalent throughout the island. The Assistant Director, who was placed in full charge of the census, reached Havana August 20, 1899, established a temporary office, and began dividing the island into districts, a task difficult and arduous, owing to a lack of accurate geographical data. By September 15 the island had been divided into 1,315 enumeration districts—afterwards increased to 1,607. Large numbers of educated Cubans, then out of employment, furnished an excellent field from which to select enumerators.

In cases of doubtful literacy, persons were required to read and write in the presence of the enumerator, and, as to illiteracy statistics, the Cuban census is probably the most accurate on record. The enumeration was fully completed by the time required, November 30, 1899. Delay in a few remote districts alone prevented a much earlier completion. The complete results are published in Spanish and English separately. The volume of 800 pages contains information not elsewhere obtainable concerning Cuba and the Cubans.

'Mechanical Tabulation of the Statistics of Agriculture in the Twelfth Census of the United States': H. T. NEWCOMB, Editor *Railway World*, formerly Expert Chief of the

Division of Agriculture in the Office of the Twelfth Census.

The public demanded of the twelfth census a more extended, elaborate and detailed investigation of American agriculture than had been undertaken by any of its predecessors. Previous censuses had collected the basic facts necessary to answer the inquiries of the public, but had never been able to undertake the complicated and extensive tabulation necessary fully to develop the information that they might have been made to supply. An investigation and tests prescribed by law finally led to the adoption of the Hollerith electrical tabulating machinery. This is controlled by cards to which the facts from the schedules returned by the enumerators are transcribed by means of perforations. Two kinds of cards were used: one providing for a description of single farms, and the other for the acreage, production and value of each of the separate crops raised on each farm. The facts indicated on these cards are all stated quantitatively and the perforations were made by machines somewhat similar in their manner of operation to a typewriter. About 115,000,000 crop cards and nearly 6,000,000 farm cards were necessary, and the former were punched at the rate of about 2,000, the latter at the rate of about 1,000, per day's work. These cards were fed into the tabulating machines, which consisted each of from three to ten connected adding machines impelled by electrical currents transmitted through the perforations. Several counting devices impelled in the same way were also added to the machines for different phases of the work; at one time as many as nineteen. In running cards through the machines an average of over 10,000 per day has been attained in the later months. The Division of Agriculture employs twelve of these tabulating machines for the farm cards and eighty-six for the crop cards.

The great advantage of the Hollerith tabulating machinery, aside from its precision, lies in the possibility of making a single transcription of data and but one handling of schedules serves for the most complicated tabulations and for those in which the same facts are classified and aggregated according to many different and conflicting elements. It also has the merit of simplifying the work of a large office and reducing the greater portion of it to the grade of factory work.

'The Single Tax': HON. JAMES CROSBY, Denver.

To the thoughtful mind the political outlook at the opening of the new century is profoundly interesting. The nineteenth century was a wonderful century, but in one sphere of human development it was a disappointment. With all our boasted progress, we have not made better citizens or a more contented people. Industrial slavery must be abolished before the social organism can be restored to health, and the single-tax philosophy contains the proper remedy. Single-taxers maintain that the reason the wages of labor do not increase as material progress advances is because rent, or the price paid for the use of land, is continually increasing. The land upon which Chicago now stands was not worth an old shoe one hundred years ago. To-day millions could not buy it. The land upon which Denver is built was valueless fifty years ago. To-day it is worth millions, and as the city grows, wages will not increase, but we all know that the value of land will. By collecting this ever-increasing rent and using it for the benefit of all the people we abolish land monopoly and solve the problem of the persistence of poverty amid an advancing civilization. This single tax is not a tax upon land, but upon land values, an entirely different matter. We are frequently told that the single tax would bear with great severity

upon the poor farmer. This criticism would be just if we proposed to tax land, but it is not true if land values are taxed. For while most of the land is in the country, most of the land values are in the city. Under the single tax system the farmer would pay very little tax. Land values are easily collected. Land cannot run away, nor can it be hid when the assessor appears. Everywhere, in all times, monopoly of the land upon which all must live and from which all wealth is produced, is the basis of social and political disorders. The single-tax system, if adopted, will destroy industrial slavery and will usher in a period of peace and prosperity for all.

'The Road Problem': JAMES W. ABBOTT, Special Agent U. S. Office of Public Road Inquiries for the Mountain Division, Denver.

The renaissance of road building began during the first half of the eighteenth century. Metcalf in England, and, contemporary with him, Tresaguet in France, were the pioneers in this movement, and were followed later by Telford and Macadam, whose methods, with slight modifications, are still used. It is a singular coincidence that correct road-building practices were evolved just before the beginning of the railway era. In the United States the first attempt at better roads was made by toll-road companies; later came the National 'Cumberland Road,' which was the beginning of an excellent system of government military roads constructed at public expense. While in Europe the railway and highway systems expanded together, in the United States the railway displaced the highway in public attention; and, with the beginning of the railway era, national appropriations for road building were discontinued. Then followed a very remarkable period of conquest of the wilderness, during which the highway question received almost no attention. The

period of awakening on this important subject began a few years ago, and probably received its first strong impulse from the League of American Wheelmen. Many states have appropriated money to aid in building state highways: New Jersey, New York, Rhode Island, Vermont, Maryland, California and many other states now have highway commissions. Wherever state funds are appropriated, the laws require the counties to share in the expense. The most striking feature of the reports of the highway commissioners is the demand for state highways, notwithstanding the requirement for contribution by the counties. The controlling reason for this demand appears to be the fact, now universally recognized, that the building of these improved State highways has vastly enhanced the values of contiguous and neighboring property. The United States Department of Agriculture, through its office of Public Road Inquiries, took up this matter a few years ago, and has been engaged in disseminating among the people information upon road conditions in Europe and America and in teaching improved methods.

'Farm Ownership and Tenancy in Delaware. A Study of Farm Tenancy': LE GRAND POWERS, Chief Statistician for Agriculture, U. S. Census.

The growth of farm tenancy, which has been noted in many States of our nation during the last thirty years, is a part of a social movement profoundly affecting the status of many families in the United States. It was the appreciation of this fact that led the government, by the tenth and subsequent censuses, to collect statistics relating to the subject. According to the twelfth census of the United States, there were in the state of Delaware, June 1, 1900, 9,687 farms. The number has steadily increased since 1850. In that year there were 6,063; in 1860, 6,568; in 1870, 7,615; in 1880, 8,749; in 1890, 9,381.

Of the farms of 1900, 4,876, or 50.4 per cent., were operated by tenants; 4,680, or 48.3 per cent., by individuals who owned the whole or a part of the land they tilled; and 131, or 1.3 per cent., were cultivated for their owners by salaried managers or overseers. A large number of the last-mentioned class were farms connected with public institutions, or the property of corporations, and most of the others were holdings of wealthy individuals and were operated as much for the pleasure as for the profit of the owners. During the last twenty years there has been a steady decrease in the number of farms operated by their owners, accompanied by a more marked increase of those operated by tenants. This actual and relative increase in the number of farm tenants has taken place under circumstances which have operated to assist a large number of families in rising from wage service to farm tenancy or ownership. None of the facts presented indicate the existence of a movement in Delaware toward the concentration of the ownership of farm property or its transfer to the hands of a fixed class of non-resident landlords. They lead to the conclusion that the titles to rented farms in Delaware are vested in a large number of persons, the majority of whom have, at some time in their lives, operated the farms now owned by them. This conclusion is warranted by the results of the investigation of the twelfth census concerning the ownership of rented farms. The ownership of rented farms is held under conditions that insure to capable and industrious wage-earners or tenants greater opportunities of becoming farm owners than ever existed in this country before 1850, or than is presented at this time in any other nation on the globe.

'What Next? Is it Socialism?' WALTER S. LOGAN, New York.

The present is industrial chaos. Where organization comes out of the chaos it is

warfare. On the one side are the employers of labor, on the other side the laborers; on the one side the people who receive dividends, on the other the people who receive wages. What is being fought over is the proceeds of labor. We have built up our economic civilization on the principle that the relation between one man and another should be dependent upon voluntary agreement between them. But now it has come to be a relation not between man and man, but a relation between class and class. The community founds itself upon the relationship. More men are now employed by single corporations than were working for wages in the whole United States a hundred years ago. Such is the present situation. It is admitted on all sides that it is intolerable. Socialism is defined to be the ownership and operation by the State of all cooperative industries within its jurisdiction—the industrial condition wherein the State is the only employer of labor and the only wage payer.

The advocates of socialism in picturing its blessings, assume that it is practicable—an assumption that has not been subjected to the test of trial. But great modern combinations have come upon the scene—so great and so extended that they approach in the complexity of their activities and the magnitude of their undertakings the functions of government itself. A paid servant only is watching other paid servants, and the eye of the master is almost as remote from the hand of the servant as it would be if the state itself were master. The success of the modern industrial combinations would seem to indicate that the state might succeed pretty well in operating its own industries. If socialism as a practical proposition is thinkable to-day, it is because these combinations have made it so. For good or for evil, they will leave us as a legacy the assurance that industrial operations approaching in extent the

operations of government itself can be successfully inaugurated and profitably carried on. As to the ultimate result, I have no opinion whatever to express. As to the immediate result, however, I have a very decided opinion. I believe we shall have, in the immediate future, not state socialism, but a more socialistic state. I agree that socialism must come if it is the only way to secure industrial peace and protect the masses of the people, but it is far from having been demonstrated yet that it is the only way to do this. I am not prepared to say that we have found another and better way, but I have confidence enough in our race's destiny to believe that we shall.

'Economic Work of the United States Geological Survey': L. F. SCHMECKEBIER, PH.D., United States Geological Survey, Washington, D. C.

The economic work of the United States Geological Survey consists of work in economic and mining geology, investigations relating to water supply and irrigation, the survey of forest reserves, the preparation of a topographical map of the United States, and the gathering of statistics relating to the mineral production of the country. In the field of mining geology the Survey works upon the general principle that it should endeavor to accomplish for the mining industry as a whole what the individual engineer or mine owner could not succeed in doing by his unaided exertions; in short the Survey undertakes to furnish the prospector and mining engineer with an accurate basis upon which their work may be founded. The hydrographic work falls into three general classes: (1) Work of a strictly engineering character, having to do with the measurement of surface streams and the conservation of water supply through the storage of flood water; (2) examination of the underground structure and the permeability of the water-bearing rocks; and (3) general reconnaissances for the pur-

pose of obtaining information as to the method of utilizing water supply for power, irrigation and domestic purposes. In the survey of the forest reserves every factor bearing upon the character and growth of the forest has been studied. The following points have been especially emphasized: The character of the soil; the forest litter; the depth of humus; the character and density of the underbrush and young growth; the range in size of trees of the principal species; the total height, clear trunk and apparent age and soundness; the effect of fires on reproduction; the proportion of dead standing timber; the character of the cutting; the means of transportation; the local demand for lumber; the effect of sheep pasturage; the use of water for irrigation and milling; and the extent and distribution of land more valuable for agriculture than for timber. The Survey is engaged in the preparation of a topographic map of the United States, which in addition to being a necessity for all other investigations undertaken in the field, has in itself a great economic value in all works of an engineering character. The statistics of mineral productions are compiled direct from reports made by the producers themselves.

'The Soil as a Social and Economic Factor': FRANK K. CAMERON, Ph.D. Soil Chemist, U. S. Department of Agriculture, Washington, D. C.

This paper was a presentation in general terms of the work which has been done and is being done upon soils from the point of view of the natural scientist. An outline of the work of the Bureau of Soils in the U. S. Department of Agriculture is given. The point is then made that such work can never, in itself alone, lead to the best development and management of soils, for it is in fact an economic problem, and the work of the physical scientist can only serve as a basis or point of departure

from which the economist may attack the problem. The causal relations between the character of the soil and the population it supports are brought out and the importance of the soil as a factor in the social and economic status of the community is insisted upon. A plea is made for more attention to the subject from experts in these lines.

'Woman's Suffrage in Colorado': J. E. LE ROSSIGNOL, Professor of Economics, University of Denver.

After the enactment of the Woman's Suffrage Law, in the year 1893, many women devoted themselves with enthusiasm to the theory and practice of politics, especially in the agitations concerning populism and free silver. Afterwards a number of leading women broke away from the regular political factions and formed organizations such as the Civic Federation, which took an active part in the municipal election of 1895, and in 1897 they secured the election of an independent ticket. Since then there has been a tendency for women to return to the regular party organizations. It is difficult to give an estimate of the value of woman's suffrage to Colorado, because of diversity of opinion on the subject, and because it is as yet impossible to prove either the success or the failure of the system from the point of view of social expediency. The woman vote is large. Women have not been injured by the franchise. The character of the leading women politicians is high. Women are not, as a rule, clamorous for office. Since 1894, ten women have sat as representatives in the Legislative Assembly, and three women have successively occupied the position of State Superintendent of Education. Women have also served acceptably as members of the various state boards. Women have exerted a civilizing influence upon the character of political meetings, and they have at times exerted an influence toward secur-

ing the nomination of respectable candidates. Some reforms have been accomplished, wholly or in part, through the influence of women. A considerable proportion of women voters are as yet somewhat independent of party control, forming an unknown quantity which disturbs the calculations of party managers, and whether called independence or fickleness, may be regarded as counting against rather than for political trickery and corruption. People who expected that society would be immediately regenerated through the influence of woman's suffrage have been grievously disappointed, and many of them, both men and women, consider the experiment a total failure. Such people have expected too much and are too impatient. No remarkable reforms have been accomplished, but it is safe to say that woman suffrage has done no harm, that it has done some good, and that it has been adopted by Colorado 'for better or for worse.'

'The World's Bread Supply': EDWARD T. PETERS, Division of Statistics, U. S. Department of Agriculture.

In his annual address as president of the British Association for the Advancement of Science, delivered at the Bristol meeting of that body in 1898, Sir William Crookes sounded an alarm as to the future of the world's wheat supply. He pointed out that the bread-eating populations, consisting of the people of Europe and of European settlers and their descendants in various parts of the world, are increasing in a geometrical ratio, and from the figures he presented, he reached the startling conclusion that, by 1931, the number of bread-eaters will have become so great as to require the produce of all the land in the world available for wheat-growing, unless there shall, in the meantime, have been an increase in the average production per acre, which, at the time of his address, he estimated for the world at large at 12.7 bushels per acre.

The conclusions reached by Sir William, as to the future wheat-exporting capabilities of the United States, have seemed to some writers to fall so far short of the truth as to make his conclusion in regard to the world at large seem unworthy of serious attention; but an article by Mr. John Hyde, statistician of the Department of Agriculture, published some time ago in the *North American Review*, if it does not entirely support Sir William's view, yet shows by an overwhelming array of well-considered facts and figures that the optimistic expectations of some of Sir William's critics are wildly extravagant. In considering the average capacity of the earth to support civilized populations, it is to be remembered that, with the rise in the general standard of living which was a conspicuous feature of nineteenth-century progress, bread became a smaller and smaller proportion of the total consumption of the people. Wants have greatly multiplied; and as these wants require the produce of land for their satisfaction, the average area required for the support of an individual is now much greater than it was one hundred years ago. Moreover, if the standard of living is to rise still higher, that average area must, in the absence of increased yields per acre, become greater still, and a still smaller proportion of it will be devoted to the production of bread. 'Man shall not live by bread alone' is receiving, with the advance of civilization, a more and more liberal interpretation, and this fact has a vital bearing on the capacity of the earth for supporting population. Population cannot increase beyond a certain point without arresting the improvement in the standard of living and starting a movement in the opposite direction, unless a means can be found of obtaining from the soil increasing yields. The point at which such increasing yields will become the only alternative to starvation may not be quite so near as Sir William

Crookes believes; but it is near enough to impress us with the vital importance of using to the utmost every agency by which skilled and scientific agriculture may be substituted for the loose and wasteful systems of the past, and also to emphasize the necessity of protecting the world's forests, conserving its waters and employing every other means by which the area of land available for productive purposes can be increased. Doubtless there is a limit to the number of human beings that the earth is capable of supporting in comfort, but science, skill and foresight may place that limit in a sufficiently distant future to remove all occasion for anxiety on the part of the earth's present inhabitants or their immediate posterity.

'The Interdependence of the Sciences': DR. MAX WEST, U. S. Industrial Commission, Washington.

This paper will be published in SCIENCE.

'The Present Status of Commerce in the Educational Policy and in the Administrative Organization of Modern Nations': JOHN FRANKLIN CROWELL, PH.D., Bureau of Statistics, U. S. Treasury Department.

This paper presented the results of an analysis of the courses of study of representative institutions, both in this country and abroad, in which higher commercial instruction has been given. In some respects our own schools are modeled after the institutions of continental Europe, but to a much greater extent they are the outgrowth of two tendencies in our national life—the expansion of our universities and the increasing influence of business men in public policy. A comparison of several of the more important higher schools of commerce in Europe and at home shows that there are five double groups of subjects regarded as essential to a comprehensive commercial curriculum of higher grade. These are: (1) Geography and history, (2) lan-

guages and methods, (3) science and technology, (4) economics and statistics, and (5) law and sociology. The preponderating influence of one or another of these groups is determined by the general character of the college. In some institutions the type of training offered is professedly technical, in others it is practically a commercial substitute for a liberal education. The liberal and the professional purposes are probably least dissociated in the curriculum of the Wharton School of Finance and Economy at the University of Pennsylvania, the oldest of the higher schools of commerce in this country.

The practice has prevailed of organizing a commercial curriculum of four years out of subjects hitherto taught in other departments. However necessary this may have been to meet a growing demand for special instruction of a higher commercial character, it has made the fundamental educational mistake of failing sufficiently to differentiate the field of commercial phenomena from that of industry on the one hand and finance on the other. There is accordingly much confusion, that must retard greatly the rate at which the field of commercial knowledge shall be reduced to scientific consistency. It is to the solution of the distinct problems of commerce that education must devote itself if it means to organize commercial experience for the aid of individual enterprise and of national prosperity. The scientific classification of commercial phenomena is preliminary to the solution of these inherent problems.

A truly scientific course in the study of commerce must fill four conditions:

1. The classification of the facts and methods of modern commerce.
2. The formulation and solution of commercial problems.
3. The grounding of the student in economic principles and in their ready application to commercial situations.

4. The mastery of knowledge relating to the history and development of commercial policy as embodied in the economic progress of modern nations.

This is the least that scientific thought can ask of higher commercial education.

'The Development of the Mineral Resources of Colorado': CHARLES W. COMSTOCK, Professor of Mining Engineering in the Colorado School of Mines.

The paper began with a few figures showing Colorado's position in the mineral-producing world, especially with regard to gold, silver and lead. The relative change in importance of silver and gold in the state's wealth was brought out. The figures showed that 49 per cent. of its production had been silver and 35 per cent. gold. The statistics of 1900 show 25 per cent. silver and 57 per cent. gold. The all-important point in the history of gold and silver production is the increased economy in the mining and the treatment of ores. This is indicated by the lower grade of the ore mined now as compared with earlier years. Even in Cripple Creek, the newest of the producing district, it is striking. The causes leading to these reductions are cheaper labor, cheaper fuel, lower freight rates, cleaner work and close attention to details. One of the potent factors in developing low-grade ores has been the improvement in ore-dressing machinery and methods, together with a more general dissemination of information with regard to this very important subject. The figures from one instance of actual practice show that proper mechanical preparation makes a change from a loss of \$5 per ton to a profit of \$2. The paper closed with a brief reference to the zinc problem which has been an absorbing one in Colorado for more than fifteen years.

'Protection of Communities by the Forest': GIFFORD PINCHOT, Forester, U. S. Department of Agriculture.

The relation of the forest to the community penetrates every portion of communal life on the material side. To follow it in detail would be to describe the modern community with a minuteness which has perhaps had little approach. For the general theme it is sufficient to say that the communal life of modern civilization as we know it would be impossible without the forest.

Forests protect communities especially by safeguarding the drainage systems on which they depend either for navigation or water supply, by fixing the drifting sands which have already overwhelmed so many towns and villages, by securing the prosperity of the tributary territory upon which the communal prosperity itself must hang, and finally, by providing the recreation grounds without which much of communal life must be flat, stale and unprofitable. The town or city forest is an institution of the highest beneficence which has yet only begun to appear in America. Examples are not uncommon abroad of towns free, either partly or wholly, from communal taxes by the revenues of their forests; and this is perhaps the least of the services which they render. Cheap and abundant supplies of wood come to the citizens from their forest lands, but best of all, the forest serves as a playground and breathing space whose influence penetrates to every portion of the community. Public spirit could take few directions more useful to the citizens, towns and villages of this country than to provide them with self-supporting recreation grounds of the forest type, for there is a quality of renewal inherent in play time in the forest which follows no other kind of rest from work.

'Leasing and Disposal of the Public Lands': C. E. WANTLAND, Denver.

The United States owns about half a billion acres, the net cost to date of the remaining lands being probably about \$250,000,-

000. To maintain the Land Department, an expenditure of about \$2,000,000 per annum is necessary. In the western states there are about 500,000,000 acres, about 400,000,000 million of which are used for grazing purposes by 25,000,000 cattle and sheep under conditions gradually growing worse. If leased, the revenue in ten years, in connection with the net receipts from sale of public lands, would double irrigated lands in the West now estimated at 10,000,000 acres. In the eleven western states we have only 250,000 farms, and 50 per cent. of the people live in towns and cities, while about 75,000,000 acres of public lands can still be reclaimed if the water which now runs to waste can be stored. Congress has failed to realize the great importance of the subject and very little constructive legislation has been secured. Forest reservations, the Carey Grant Act and the recent Free Homes Bill were secured after great difficulties. Public lands should be leased for short terms in limited quantities and at low rates. Owing to different conditions in the different states, leases should be issued on a county local-option basis, after careful classification of lands by commissioners and approval by stockmen. Funds should be used for reducing county taxes, for surveys and reservoir construction. The majority of stockmen are now in favor of a good lease plan, fair to all concerned. The Homestead law should be amended to enable settlers by a combination homestead and lease privilege to control enough land to make a living on, and the Government should advertise the facts about public lands for the benefit of people who want new homes. The Desert Land Law should be repealed. Forest protection and the reclamation of the arid lands will bring great prosperity to the country. The landless man of the east must be placed upon the manless land of the west.

'Irrigation': F. H. NEWELL, Hydrographer, U. S. Geological Survey.

The western half of the United States consists for the greater part of vacant land belonging to the nation and at the disposal of Congress. With this enormous area, aggregating fully one-third of the United States, it would be supposed that settlement would progress rapidly and population increase with stupendous strides. As a matter of fact, however, the past decade has not been marked by notable developments, but, on the contrary, it appears that the settled area has to a small extent actually diminished. As a rule the soil and climate are suitable for the production of large crops, were it not for the scarcity of moisture. The pioneers and their successors have taken out almost innumerable ditches and have diverted the smaller streams, demonstrating the practicability and profitable character of agriculture by the artificial application of water. In all, about ten million acres of land have been brought under cultivation by means of works built largely by farmers acting in partnership or in associations. Irrigation development when brought about in this manner has been extremely profitable. But, contrary to the experience of the farmers, large irrigation enterprises have almost invariably been financial failures. This anomalous condition, where enterprises succeed in a small way but fail financially on a large scale, merits careful consideration. There are upwards of seventy million, or even a hundred million, acres of arable land which might be reclaimed and made into homes by utilizing the waters of the large rivers or of the floods which now run to waste. The reason for the failure of the large enterprises lies for the most part in the difficulty of securing immediate settlement and of obtaining experienced farmers who can practice irrigation with success from the outset.

One of the great questions now before the people of the country is how to dispose of the crowded and surplus population around the great manufacturing centers and to render the idle laborers producers of wealth instead of helpless consumers. The public lands in the past have proved the great outlet for superfluous labor, especially at the periodical occurrence of hard times. Vast areas of fertile public lands still remain, but these cannot be utilized until the problem of supplementing the deficient water supply can be solved. This problem of water supply for the arid lands is one which must be taken up by the publicist and statesman. The engineering features are comparatively simple, but the great question to be solved is as to who is to pay for the original outlay. The public at large is undoubtedly the gainer, since by the creation of prosperous homes upon the public domain the commonwealth is strengthened, and commerce and manufacture increased. A similar question with regard to the building of light-houses and the improvement of harbors has been answered by the national government taking charge of the matter, and it is urged by many who have studied the matter thoroughly that Congress, the custodian of the public lands, must take cognizance of present conditions and not only modify the land laws to suit the conditions of the arid West, but also provide means by which large rivers may be made available and floods held so that the farmers by their own work may be able to utilize the waters, as has been done by their predecessors.

'The Scope of National Aid for Irrigation': FRED BOND, State Irrigation Engineer, Cheyenne, Wyo.

Irrigation laws are a necessary part of the statutes of every state any portion of which lies west of the 100th meridian, and they form a part of the statutes of those states. These laws are enacted for the

purpose of governing the diversion and appropriation of water and its use, and state codes and state statutes alone define water rights and provide for their determination and administration. The general government has never undertaken to exercise any authority over water used in irrigation, but has left the control of the water in the arid region entirely to the states wherein found. Whatever might have been originally undertaken with advantage by the nation does not change present conditions, and it is now too late, even were such action desirable, to undertake the enactment of laws which will come into conflict with the long-conceded rights of the states to regulate and control these matters; nor can the government determine future rights or undertake their administration without creating a conflict between those state and national authorities which have the diversion of water directly in charge. The funds for irrigation development must come from some national resource, for the states are financially unable to raise them, and no matter how willing many of them might be, they are precluded from the undertaking because the limits of taxation permitted by their respective constitutions has been reached in providing means to meet ordinary state expenses. They are, however, not only ready and willing, but entirely capable of prosecuting the work to a successful conclusion, the means being found. The funds should come from such a source as would bring about the least possible interference with present conditions, and the appropriation or setting apart of the receipts from the sale of arid lands seems most completely to fill these requirements. The volume of work undertaken in any state each year may be limited by the receipts from the sale of public lands in such state for the year previous, a plan commendable in that interests not benefited are not required to render any assistance in the work. The amount ob-

tained in this manner from any one state would not be large, but would enable a beginning to be made and at the same time give the state an opportunity to demonstrate its fitness to continue in the work of its own development under these conditions.

A part of the discussion which followed this paper is given :

F. H. Newell: The proposition presented by Mr. Bond is one which has been fully discussed by committees in Congress. The general conception is not new, but the point which he emphasizes, of the importance of state control of national funds in irrigation development, is one which, it is feared, will prove a stumbling-block to progress. Relatively few of the states would be benefited if the proceeds from the disposal of public lands in each state were devoted exclusively to works in that state. This narrowing of development is undoubtedly the outgrowth of an attempt made to cede the vacant public lands to the states to be disposed of by the legislatures. This has been shown to be contrary to the whole spirit of national administration of the public lands; these lands being held, not for the benefit of the states in which they are located, but for the making of homes by citizens. There is no apparent ground for the fear of conflict between national and state authority. There can be no question as to the importance of national development of vacant public lands, which still include nearly one-third of the United States. It is practicable for the government to erect storage reservoirs, and to divert large rivers to a point where settlers can take out the water and make for themselves homes as was done by the pioneers. The further limitation, however, which Mr. Bond seems to insist upon, that this work should be done by state officials, is one which is so opposed to all experience and precedents that it would doubtless weaken the movement in the minds of those who have studied the subject.

George H. Maxwell, Chairman of the Executive Committee of the National Irrigation Association, expressed the opinion that the paper by Mr. Bond tended to create an entirely wrong impression as to the relation of the national Government to irrigation development. No one, he said, contends or proposes that the national Government should undertake in any way to regulate the distribution of water in conflict with the laws of the state. It is proposed that the Government shall do two things: First, enlarge its policy of internal improvements to include water storage through appropriations under the river and harbor bill, the water so stored to be turned into the stream in the dry season and distributed under the state laws just as though nature had put it there. Second, build such reservoirs and irrigation works as may be necessary to bring water within reach of settlers on the public lands, reserving lands for which water is thus made available for actual settlers only, and charging the lands in proportion to benefits with the actual cost of the Government works. In carrying out this latter policy the Government occupies the relation to the states of a land owner, and will proceed just as any other land owner would do to accomplish the reclamation and settlement of his land. It is conceded in Mr. Bond's article that the national resources must provide the funds for this irrigation development. This being so, the national Government will administer their disbursement. It has steadily refused to cede the public lands to the states, because experience has shown that such a policy would result in the lands being improvidently administered or absorbed in large holdings by speculators. The same result would follow if the control of their reclamation were turned over to the states. The national Government will never appropriate money from any source for state engineers to spend to reclaim the public

domain. The sole ultimate object of the national irrigation policy is to make homes on the public domain, and when this has been done the national purpose has been accomplished. Until the home-builder is actually there, the national Government will never abdicate its functions or transfer to state politicians the administration of this great national trust.

'The Grand Canyon of the Gunnison.' Illustrated evening lecture by A. L. FELLOWS, Resident Hydrographer of U. S. Geological Survey, Denver.

Below the Black Canyon of the Gunnison, which is traversed by the D. & R. G. Railway in Western Colorado there remains still a portion of the Gunnison canyon which has been practically unknown, and a portion at least of which has never been explored until it was investigated by Mr. A. L. Fellows, resident hydrographer of the U. S. Geological Survey, and by one companion, Mr. Will Torrence, of Montrose, Colorado, in the month of August, 1901. This portion of the Gunnison Canyon is known in Hayden's survey as the Grand Canyon of the Gunnison, and although a number of efforts had been made to penetrate its secrets, these efforts have been without avail until the present attempt. This is the more extraordinary as there is no portion of Colorado that can compare with it in scenic grandeur, and the problems in geology that are presented are also of intense interest. The absolutely unexplored portion is of but a few miles in length, but there are some thirty-five miles of which very little is known. This is that portion of the canyon between the mouth of the Cimarron River at Cimarron and the mouth of Uncompahgre at Delta. The plateau which is cut by the Grand Canyon of the Gunnison is known as the Vernal Mesa, and appears to have been caused by an uplifting of the overlying strata by geological forces beneath. The sandstones

of the surrounding region were uplifted several thousand feet above the adjacent territory, but these sandstones have been eroded from the region traversed by the canyon, and the canyon itself is eroded into the metamorphic granite and through crystalline rocks to a depth at present amounting to about 2,000 feet on the average below the surrounding territory. The walls are in many cases very nearly vertical, and at times are strangely marked by gigantic veins of quartz. The flora and fauna of the canyon do not differ materially from those of other Colorado canyons, the stream being lined by spruce and cottonwood trees, and the canyon being occupied, to some extent at least, by the usual fauna of the wilder portions of Colorado. The investigation was made in the interest of a survey that is being carried on by the hydrographic division of the U. S. Geological Survey under the general direction of Mr. F. H. Newell, for the purpose of determining the feasibility of diverting the water of the Gunnison into the Uncompahgre Valley for the irrigation of its lands. The trip was made, commenced on the 12th and ended on the 21st of August, 1901. The investigation resulted in the obtaining of practically all the data desired, over a hundred excellent views of the canyon being taken, and copious memoranda made concerning the nature of the rocks and other features of interest. The trip was an excessively hard one, and was made with the lightest possible equipment, the explorers being obliged to take to the river and swim some seventy-odd times, besides scaling the sides of the cliffs times innumerable.

'The Development of Irrigation in Colorado': L. G. CARPENTER, Director of Experiment Station and Professor of Irrigation, Fort Collins, Colorado.

'The Social and Economic Aspects of Irrigation': GEORGE H. MAXWELL, Chairman

of Executive Committee of National Irrigation Association, Washington.

RAYMOND A. PEARSON,
Secretary.

AMERICAN ORNITHOLOGISTS' UNION.

THE Nineteenth Congress of the American Ornithologists' Union convened in New York City, Monday evening, November 11. The business meeting of the Fellows was held at the American Museum of Natural History, and the public sessions, commencing Tuesday, November 12, and lasting three days, were also held at the Museum.

Dr. C. Hart Merriam, of Washington, D. C., was reelected president; Charles B. Cory, of Boston, and C. F. Batchelder, of Cambridge, Mass., vice-presidents; John H. Sage, of Portland, Conn., secretary; William Dutcher, of New York City, treasurer; Frank M. Chapman, Ruthven Deane, E. W. Nelson, Witmer Stone, Drs. A. K. Fisher, Jonathan Dwight, Jr., and Thos. S. Roberts, members of the Council.

The ex-presidents of the Union, Dr. J. A. Allen and Messrs. William Brewster, D. G. Elliot and Robert Ridgway, are *ex-officio* members of the Council.

Outram Bangs, of Boston, Joseph Grinnell, of Palo Alto, Cal., Dr. T. S. Palmer and Professor F. E. L. Beal, of Washington, D. C., and Dr. Louis B. Bishop, of New Haven, Conn., were elected Fellows.

Montague Chamberlain, of Boston, was elected to corresponding membership. Fifty-five associates were elected to the new class known as members, and eighty-three new associates were elected.

By the adoption of certain amendments to the By-Laws, at the present Congress, the following classes of members are now recognized by the Union, viz., Fellows, Honorary Fellows, Corresponding Fellows, Members and Associates.

Dr. J. A. Allen, in his paper on 'The

Present Outlook for Stability in Nomenclature,' dwelt upon the American method and its gradual acceptance by foreign ornithologists as well as by workers in other branches of science.

Mr. E. W. Nelson described a collecting trip which he took through portions of Yucatan. In that country, occupied until recently by hostile Indian tribes, he discovered more than one hundred birds new to science.

Mr. Ruthven Deane exhibited books and other relics from his own library which were once the property of John James Audubon. What he had to say on 'Auduboniana,' was of historic interest.

The report of the Committee on Protection of North American Birds showed that satisfactory results had been obtained during the past year. Mr. Dutcher spoke of the great good for protection made possible by the 'Thayer Fund'—money raised through the efforts of Mr. Abbott H. Thayer. By its aid Dr. T. S. Palmer and Mr. Dutcher had been able to appear before legislative committees in many States, and new and better protective laws had been passed. Mr. Chapman referred to the present abundance of bird life on Gardiners Island, N. Y., the result of rigid protection.

Professor W. W. Cooke traced the routes of bird migration across the Gulf of Mexico, bringing out many new and interesting facts.

Excellent lantern slides from photographs of birds in life were shown by Rev. H. K. Job, and Messrs. Nelson, Chapman, Dutcher and Raily.

The New York Zoological Society invited the members of the Union to visit its park, and many availed themselves of the privilege November 15. Director Hornaday conducted the party through the grounds.

Following is a list of the papers read at the sessions.

'The Present Outlook for Stability in Nomenclature': J. A. ALLEN.

'The Plumages of the American Goldfinch (*Spinus tristis*): JONATHAN DWIGHT, JR.

'Routes of Bird Migration across the Gulf of Mexico': W. W. COOKE.

'On Methods in Museum Bird Exhibits': FRANK M. CHAPMAN.

'Ornithological Notes from Northern New Hampshire': JOHN N. CLARK.

'Some Impressions of Texas Birds': LOUIS AGASSIZ FUERTES and H. C. OBERHOLSER.

'The White-winged Crossbill in Captivity': JAMES H. HILL.

'The American and European Herring Gulls': J. A. ALLEN.

'Auduboniana': RUTHVEN DEANE.

'The Molts and Plumages of the North American Ducks (*Anatide*): JONATHAN DWIGHT, JR.

'A Naturalist in Yucatan,' illustrated by lantern slides: E. W. NELSON.

'Photography in North Dakota Bird Colonies,' *et cetera*, illustrated by lantern slides: HERBERT K. JOB.

'A Reconnaissance in Manitoba and the Northwest,' illustrated by lantern slides: FRANK M. CHAPMAN.

'Are Humming Birds Cypseloid or Caprimulgid?' HUBERT LYMAN CLARK.

'List of Birds of Wequetonsing, Mich.': OTTO WIDMANN.

'Notes on the Ornithological Observations of Peter Kalm': SPENCER TROTTER.

'Report of the Committee on the Protection of North American Birds': WITMER STONE.

'Results obtained under the Thayer Fund': WILLIAM DUTCHER.

'National Bird Protection—Its Opportunities and Limitations': T. S. PALMER.

'Gulls of the Maine Coast, and Miscellaneous Notes,' illustrated by lantern slides: WM. DUTCHER and WM. L. BAILY.

'Some Results of Bird Protection,' illustrated by lantern slides: FRANK M. CHAPMAN.

The next annual meeting will be held in Washington, D. C., commencing November 17, 1902.

JOHN H. SAGE,
Secretary.

JOSEPH HIRSCH.

THE biography of the late Joseph Hirsch, briefly sketched, is as follows:

Born May 22, 1836, of an old and well-known family, characterized in all its branches by taste, refinement, and ability, and with a strong proclivity toward both art and engineering, he studied at the *École Polytechnique* and became an engineer of the *Ponts et Chaussées*, standing at the head of his class in line of promotion from the first. He served in Marseilles, Algiers and Alsacia, and accepted missions in Germany and Austria. In 1861 he was engaged in the construction of the Houillères de la Sarre canal, inventing, meantime, the ingenious syphon arrangement by which its level is automatically maintained. In 1867 he was assigned to special service relative to the work of improvement of the navigation of the Saone, and presently, on his marriage with Mlle. Dreyfus-Dupont, whose distinguished relatives in this country are so well known to all engineers and army and navy men, he secured indefinite leave from the Government and devoted himself to the study and investigations which so liberally offered themselves in connection with the great iron and steel works of his father-in-law. After the close of the Franco-German war, one of these establishments, on then German territory, was sold, and Hirsch erected new and modern works at Pompey, near Fruard. In this construction he introduced every modern appliance and made it a model of its kind.

The children of this fortunate union growing up, it was decided to take up residence in Paris, and for many years, No. 1, rue de Castiglione, was a center of social,

scientific and artistic life. Meantime, his two brothers had become famous, the one as artist, the other as architect, and aided in making the new life beautiful and profitable.

In 1876 Hirsch was appointed to the chair of 'The Steam Engine,' at the *École des Ponts et Chaussées*, and, until his retirement at the age limit in 1898, he steadily added to the fame of that great institution. After those twenty-two years of service, the Inspector-General reported:

"To great scientific knowledge he added from the first extensive practical information, the fruit of personal experience, which enabled him to conduct his course as a practitioner, as well as a *savant*, and thus to give it the character most appropriate to the *École des Ponts et Chaussées*."

At his retirement he distributed a considerable sum, 10,000 fr. for ten years, in prizes for students '*les plus méritants et le moins fortunés*.' He 'gave much but with discretion; he took the trouble to give usefully.' Riches, in his view, created an indebtedness to his country and his people which he was always willing and glad to discharge.

Hirsch added to his work at the *Ponts et Chaussées* that of the department of Mechanics at the *Conservatoire des Arts et Métiers* (1886), and took great pleasure in directing its evening classes and teaching the crudely educated, as well as the well-prepared, pupils at the government school. In 1879 he was on the 'State Commission of Steam Engines'; in 1880 he had charge of the office of engineer-in-chief of the department of purchase and inspection of materials for the state railways. He was on the international juries of 1878, 1889 and 1900 in Paris, and in 1878 received the cross of *Chevalier de la Légion d'honneur* and, in 1900, that of *Officier*.

M. Hirsch published his course at the *Ponts et Chaussées* in the '*Encyclopédie des*

travaux publics,' and, in its first volume, on the steam engine, had the assistance of M. Debize. His reports upon the machinery exhibited at the International Expositions appeared in the volumes officially issued from the government press.

As M. Dartein says: "*Telles sont été les principales occupations et les travaux le plus notoires du savant ingénieur, du professeur accompli, du chercheur original, de l'homme de bien dans la plus haute acception de ce mot, qu'une mort subite vient d'arracher à la tendresse de sa famille et à l'affection de ses amis. * * * Adieu, camarade et ami, ou plutôt au revoir: ta mémoire nous demeurera chère et ton exemple nous restera utile.*"

An acquaintance of many years' duration permits the writer to speak with confidence in confirmation of the testimony given by his professional colleagues at the meetings of various societies after his death. In his home and in his private capacity he illustrated the noblest attributes of the gentleman and the scholar; serious yet always kindly and affectionate, giving and eliciting respect and affection, sweet reasonableness accompanying correct judgment and clear views of right and wrong, familiar yet dignified, provident yet liberal, as husband, father, friend, he was invariably and completely admirable. Professionally he was a leader. Practically experienced, technically learned, cultured and efficient, he was a reliable adviser and director in his whole wide field of special work. He was admired, respected and honored by every client, as by every colleague.

His record, official, professional and private, stands a permanent memorial to the man.

R. H. THURSTON.

SCIENTIFIC BOOKS.

Les Variations de Longueur des Glaciers dans les Régions Arctique et Boréales. By CHARLES RABOT. Archives des Sci. Phys. et Nat. Geneva, 1897, 1899 and 1900.

The literature of the variations of glaciers has been greatly enriched by the contributions of M. Rabot. He has brought together in a convenient form the observations that have been made on the northern glaciers, with references to his sources of information, so as not only to give an excellent review of what is known of these glaciers, but also to give the data for comparisons with future work. Many of the original publications which he refers to are in languages, such as Icelandic, Danish, Swedish and Norwegian, which are little known outside of the regions where they are spoken, so that his extracts and synopses bring before us important facts which could not be obtained otherwise without great difficulty. He does not confine himself to the variations of glaciers only, but also gives descriptions, measures of the motion, observations on melting, etc. Although he disclaims that his work is complete, it will be recognized that the incompleteness is not due to oversight on his part, but to paucity of exact information on the subject. One is surprised, indeed, that he has been able to collect so many facts regarding more than 250 glaciers, many in very remote regions.

M. Rabot divides glaciers into three classes: *inland ice*, such as the ice covering of Greenland with its great ice streams which reach tidewater, including smaller local ice-caps; *Alpine glaciers*, with which we are familiar in the Alps; and *composite* or *Alpine-Norwegian glaciers*, an intermediate form grading into each of the other two. Glaciers of the first class are the most common in the arctics.

In temperate regions, the variations of a glacier are easily determined by the change in the position of its end; but this is not so simple among arctic glaciers. Many of them end in fiords and the ice is continually breaking off as icebergs, so that the point where they end varies according as we observe them shortly before or after much ice has broken off. M. Rabot thinks the intensity of the calving is a better criterion of the state of the glacier; if much ice is coming off and at the same time the glacier is not materially receding, it is to be considered in growth; and *vice versa*.

M. Rabot reviews the observations of the

glaciers of Grinnell Land, Greenland, Jan Mayen's Land, Iceland, Spitzbergen, Francis-Joseph Land and Scandinavia, five of which regions he has himself visited, and brings out many interesting facts, but we can only notice the most important of his conclusions. Of the regions mentioned Iceland and Norway furnish the most detailed information for the longest time. It is well established that the glaciers of these two countries were much smaller before the eighteenth century than they are now, and that this smaller extension lasted for several centuries; that there was a great advance during the eighteenth century interrupted for a short time about 1750; that during the nineteenth century there has been a slight retreat marked by several minor variations, though the glaciers are still considerably larger than they were during and before the eighteenth century. A Norwegian document of the eighteenth century contains a general description of the Greenland glaciers which might apply to the country to-day, so we must infer that the extent of the ice did not differ very greatly then from what it is now. With the exception of this document all accurate information of the Greenland glaciers refers to the period since 1850. Observations since then are not at all concordant, but they seem to show in general a stationary condition or a slight advance. The natives are unanimous in asserting that the ice has been advancing within historic (?) times. The fewer observations in Jan Mayen's Land and Spitzbergen indicate that their glaciers have followed the same history as those of Iceland and Norway. The glaciers of Grinnell Land and Francis-Joseph Land appear to be retreating at present. Local ice caps, probably of comparatively recent origin, cover the islands which make up the latter.

M. Rabot mentions that the glaciers of southeastern Alaska seem to have been at a maximum at the end of the eighteenth century; and it may be added that observations in Glacier Bay show that there was a long period in which the glaciers were much smaller than at present, followed by the comparatively short but strong advance which apparently culminated at the above date, and that since then there has been a general retreat; so that it seems quite probable that the Alaskan glaciers have experienced

variations synchronous with those of the Arctics.

The general conclusions are that in the Arctics the eighteenth century was a period of very marked advance of the glaciers, that this was preceded by several centuries of great retreat, and followed by a small retreat which is still in progress. Where the information is sufficient these conclusions are fully established; where it is meager they are partially confirmed or at least not contradicted.

M. Rabot points out certain resemblances and differences between the variations of the arctic glaciers and those of the Alps. Although, so far as can be made out, there seems to be a fair accord in the dates of the variations, there seems little relation between their respective intensities. The general advance of the arctic glaciers in the eighteenth century was not marked in the Alps; and the strong retreat of the second half of the eighteenth century in the Alps is but faintly shown in the Arctics. Moreover, it has not been possible to show a distinct relation between the variations of climate and the variations of the glaciers in the Arctics as has been done in the Alps.

M. Rabot has accomplished what must have been a laborious task, and deserves the thanks of all persons interested in the variations of glaciers.

HARRY FIELDING REID.

GEOLOGICAL LABORATORY,
JOHNS HOPKINS UNIVERSITY.

The Brain of Acipenser. A Contribution to the Morphology of the Vertebrate Brain. By J. B. JOHNSTON, Professor of Zoology, West Virginia University. Zool. Jahrb., Abt. f. Anatomie, Bd. XV., Jena, 1901, pp. 204, with 12 plates and 22 text-figures.

The application of the cell theory to the nervous system (for this is what the doctrine of the neurone amounts to in the upshot) has reached its consummation only within the past decade. Accordingly, the neurology of to-day, whether human or comparative, demands not merely topographic descriptions of the tracts and nuclei within the brain, but the precise relations between the two, stated anatomically in terms of cellular morphology as well as in terms of experimental pathology. This necessi-

tates the rewriting of some chapters in the standard text-books and the repetition of many classical researches upon the lower animals with 'modern neurological methods.'

Such, then, is the motive which has led Professor Johnston to attempt 'a complete study by modern methods of the brain of a lower vertebrate.' The type chosen, the sturgeon, was described in 1888 by Goronowitsch, and the present study aims to fill in the cellular details upon the basis of the topography as there laid down (with the result, we may add parenthetically, of correcting several errors both of fact and of morphological interpretation found in Goronowitsch's account). Standard histological methods—among which judicious staining with Delafield's hæmatoxylin is still unrivaled for lower brains—were, accordingly, supplemented by the use of methylene blue in various forms and by chrome silver impregnation. The author's results with the latter method are especially brilliant. He has succeeded in getting whole brains impregnated and cut into unbroken series of sections, so that the courses of the more important tracts could be controlled by the actual demonstration of the paths of individual fibers through them.

Of the 12 plates accompanying the paper, one is a chart showing all the more important fiber tracts in the brain of this fish elucidated by an ingenious color scheme, the reflex arc being represented as consisting of a chain of several links which are indicated by colors of the spectrum, sensory roots blue and motor roots red, with the connecting tracts in series between. The other plates (all photographic reproductions from untouched negatives) include seven views of the entire brain, 56 photographs of Golgi preparations, illustrating nearly all the important types of neurones in the brain, and 21 transverse sections from a series stained with Delafield's hæmatoxylin to illustrate the topography. The latter are accompanied by lettered outline drawings on transparent paper and incorporate also some results of the study of Golgi sections.

Dr. Johnston is one of the few neurologists who give evidence of an adequate appreciation of the importance of the peripheral nervous system as furnishing the key to the central, and

who accordingly have fully and sympathetically entered into the doctrine of nerve components as developed within the past decade. While he has not himself studied the peripheral nervous system of *Acipenser*, his analysis of the medulla oblongata has been made in the light of the facts of peripheral connections already known, and hence his results are of far-reaching importance to the major problems of the morphology of this confusing region. Into the details of these results we cannot now go, merely calling attention to the fact that in this connection he has made some observations of great importance to the phylogeny and organogeny of the vertebrate nervous system.

For instance, he confirms statements of previous writers that the communis, or visceral sensory, system of cranial nerves is related anatomically with centers both in the oblongata and in the spinal cord which are quite distinct from those of the tactile nerves (general cutaneous centers and dorsal horns). On the other hand, the acustico-lateral system of cranial nerves, innervating the ear and lateral line organs, is structurally very intimately related to the general cutaneous centers and dorsal horns. Johnston, in agreement with other very recent writers, finds the cerebellum directly related with the tuberculum acusticum, all the types of cells characteristic of the cerebellum being represented in the acusticum by transitional forms. From this it follows that the cerebellum and acustico-lateral nerve centers are phylogenetically derived from the dorsal horns of the spinal cord. It is important that this interesting conclusion be controlled by studies upon still more primitive vertebrates and by embryological studies upon the lower fishes, and that the succeeding steps in this evolutionary process be worked out in the types next above the ganoids. The first of these desiderata has already been met in large measure by an exhaustive study of the brain of the lamprey by similar methods, which Dr. Johnston has now in press in an American journal and by which the main theoretical conclusions of this paper are confirmed in a striking manner.

Another critical region upon which interesting conclusions are expressed is the pallium.

"There are found in *Acipenser* two sets of cells which seem to constitute the earliest representative of the cortex proper. One of these serves to connect the epistriata of the two sides by fibers through the anterior commissure. The other is found in the dorsal membranous roof of the fore-brain and probably corresponds to the dorsal or dorso-median cortex of reptiles. The transformation of a membranous pallium into a massive nervous pallium, which has recently been declared impossible, is seen in actual progress in its early stages in *Acipenser*."

In conclusion, we may add that, whether Dr. Johnston's theoretical conclusions stand or fall (and we think that for the most part they will stand), the cause of sound morphology is best promoted by just such exhaustive and painstaking researches as this one, by which a secure basis of positive fact is first laid down.

C. JUDSON HERRICK.

The Smithsonian Institution, Documents Relative to its Origin and History, 1835-1899. Compiled and edited by WILLIAM JONES RHEES. In two volumes. Vol. I., 1835-1887. Twenty-fourth Congress to Forty-ninth Congress. Washington, Government Printing Office. 1901. Pp. liii + 1044.

The Smithsonian Institution is taking praiseworthy pains to make permanent records of its origin, history and activities, so that the future historian of science in America shall be able to draw from authorized sources. Three volumes have previously appeared pertaining to the origin and history of Smithsonian's foundation, one bearing a title similar to that under review, one dealing with the 'Journals of the Board of Regents, Reports of Committees, Statistics,' and the third, the large, handsome work, 'History of the First Half Century,' edited by Dr. George Brown Goode and published in 1897. The volume in hand is compiled and edited by one who has been in the service of the Institution under all three secretaries, as chief clerk and now as keeper of archives, and whose familiarity with the life of the Smithsonian, together with painstaking research, has produced a valuable work.

The book is complementary to that issued in 1879, and contains in detail the history of the

relations of the Institution to Congress, as found in the volumes of the *Congressional Globe* and *Congressional Record*, the Journals of the Senate and House, and the Statutes at Large. Part I. contains the documents pertaining to the foundation, the will of James Smithson, the correspondence ensuing and statements of other bequests to the Institution; Part II. embraces legislation relative to the establishment of the Institution, 1835-1847; Part III. embraces the legislation in Congress from 1847 to 1887; and according to the table of contents of a second volume (printed in Vol. I.), that will contain details of legislation from 1887 to 1899.

These volumes will prove indispensable to those seeking full and accurate information of the Smithsonian Institution.

H. C. B.

A College Text-book of Chemistry. By IRA REMSEN. New York, Henry Holt and Co. 1901. Pp. xx + 689.

This book is intended to fill a place between the 'Inorganic Chemistry' and the elementary text-books by the same author. After an introductory chapter, in which some fundamental principles, including the laws of definite and multiple proportions, symbols, and equations, are discussed, six chapters are given to oxygen, hydrogen, water and the atomic theory. The remaining elements are considered in the following order of the families of the periodic system: Chlorine, nitrogen, carbon, lithium, glucinum, aluminium, copper, zinc, gallium, germanium, chromium, manganese, iron, platinum. Two short chapters on carbon compounds close the book. At appropriate points, topics pertaining to theoretical chemistry are taken up, such as the periodic law, mass action, dissociation, osmotic pressure, Faraday's law and atomic heats.

While President Remsen believes that 'the time has not yet come for the abandonment of the study of elements and their compounds in what some are pleased to call the old-fashioned way,' those subjects which pertain to what is commonly known as physical chemistry receive a fair degree of attention. Not only are the fundamental theories of solutions discussed in detail in two or three places, but several applications of the theory are considered in con-

nection with individual compounds. The great importance of such a reiteration of fundamental principles is, of course, clearly recognized by all successful teachers.

The laboratory study which the author intends should accompany the use of the text is indicated by a series of experiments at the close of the successive chapters. A few quantitative experiments are included. The subjects for experimental illustration are mostly well selected, but the addition of some work, demonstrating the fundamental properties of solutions is needed.

The book, as a whole, is written in that clear and fluent English which is so characteristic of the author and which has done so much to make him one of the greatest of the teachers of chemistry.

W. A. NOYES.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for November opens with an article on 'The Parasitic Origin of Macroergates among Ants,' by W. M. Wheeler, in which the writer describes the occurrence of certain monstrous workers of the genus *Pheidole* caused by the presence of a parasite of the genus *Mermis*. These macroergates are compared with phenomena observed among other species, the author concluding that the character of the adult ants is not due to the efforts of the attendant workers alone, but also to a certain amount of initiative in the larvæ. H. L. Osborn describes 'Some Points in the Anatomy of a Collection of Axolotls from Colorado, and a Specimen from North Dakota,' these points being wholly external and connected with the change of *Siredon* into *Amblystoma*. 'A Parasitic or Commensal Oligochaete in New England' is described in some detail by M. A. Willcox, and Albert C. Eycleshymer gives some interesting 'Observations on the Breeding Habits of *Ameiurus nebulosus*.' M. Louise Nichols considers 'The Spermatogenesis of *Oniscus Asellus* Lim., with especial reference to the History of the Chromatin,' and George H. T. Nuttall treats of 'The Formation of Specific Anti-Bodies in the Blood, following upon Treatment with the Sera of Different Animals,' giving the results of a series of investigations which

show that, although the bloods of various animals may be mixed, they may be detected and differentiated. The final paper, by W. J. Kent, is on 'The Colors of the Crayfish': red may be caused by exposure to sunlight or by environment, but all other colors are the result of environment and are protective in their nature.

The Osprey for September contains the 'Song Birds of the Kissimmee Valley, Florida,' by Wm. Palmer, 'A Visit to Otter Rock, Pacific Ocean,' by A. G. Prill; 'Notes on the Blue Grosbeak, *Guiraca caerulea*,' by John W. Daniel, Jr.; the tenth instalment of 'William Swainson and His Times,' by Theodore Gill; a second paper on 'The Cage Birds of Calcutta,' by Frank Finn; and the eighth and final chapter of 'The Osprey or Fishhawk: Its Characteristics and Habits,' by Theodore Gill. An editorial on 'Work and Worry for the Classicists' shows some of the numerous troubles in store for those zoologists who propose to abide by the decision of the majority, in regard to nomenclature, at the last international zoological congress.

The Plant World for October contains the second part of 'Notes on Trees of Cuba,' by Valery Havard; 'Some Interesting Cases of Plant Distribution,' by John M. Holzinger; 'The Knubble, Advice to Beginners in Botany,' by Walter Deane; and many briefer articles and notes on current literature. The supplement on the 'Families of Flowering Plants,' by Charles L. Pollard, is devoted to a continuation of the descriptions of the families of the order Sapindales.

The American Museum Journal for October should be in demand by ornithologists, for it has for supplement a twenty-four-page 'leaflet' devoted to the Bird Rock Group recently placed on exhibition. This is by Mr. Chapman, and is admirably illustrated by reproductions of the group and of the real Bird Rock whose bird life it so well represents. The *Journal* proper contains notes on the summer's work of the various field parties of the Museum, and on the recent acquisitions.

Journal of Physical Chemistry, October. 'On the First Plait in van der Waals's Free Energy

Surface for Mixtures of Two Substances,' by Ch. M. A. Hartman (Physical Laboratory, Leiden). This contains a review of the investigations referring to binary mixtures and a bibliography. 'A New Proof of the Formula $d = \frac{.02T^2}{L}$,' by Felix Lengfeld. 'The Influence of Electrical Waves on Chemical Action,' by Felix Lengfeld and James H. Ransom. 'On the Dielectric Constants of Pure Solvents,' by Herman Schlundt. The work of Dr. Schlundt was carried out under the supervision of Professor Kahlenberg, of the University of Wisconsin, and while a number of new examples have been found which follow the Nernst-Thomson rule, that the greater the dielectric constant of a solvent the greater is its dissociating power, some striking exceptions have also been found, from which it is argued that the rule is inadequate.

SOCIETIES AND ACADEMIES.

CALENDAR.

The American Association for the Advancement of Science. A meeting of the council will be held at the Quadrangle Club, University of Chicago, on the afternoon of January 1. Section H (Anthropology) will meet at the Field Columbian Museum, Chicago (December 31 and January 1). The next regular meeting of the Association will be held at Pittsburg, Pa. (June 28 to July 3). A winter meeting is planned to be held at Washington during the convocation week of 1902-3.

The American Society of Naturalists will hold its annual meeting at the University of Chicago (December 31 and January 1). In conjunction with it will meet the Naturalists of the Central States and several affiliated societies, including The American Morphological Society (beginning on January 1; The American Physiological Society (December 30 and 31); The American Psychological Association and the Western Philosophical Association (December 31 and January 1 and 2); The Society of American Bacteriologists (December 31 and January 1), and The American Association of Anatomists (December 31 and January 1 and 2).

The American Chemical Society will meet at the University of Pennsylvania, Philadelphia (December 30 and 31).

The Society for Plant Morphology and Physiology will hold its fifth annual meeting at Columbia University, New York City (December 31 and January 1 and 2).

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY OF THE NEW YORK ACADEMY OF SCIENCES.

THE Section met on the evening of November 4.

Dr. S. A. Mitchell gave a very interesting report of the recent Eclipse Expedition to Sumatra. Numerous lantern slides were exhibited, showing the arrangement of the apparatus at the different stations. The paper is given in full in SCIENCE.

Professor William Hallock gave a report of some recent work on underground temperatures.

Dr. L. Boroschek gave an account of some work he had undertaken in connection with Dr. Tufts on the absorption of light by some dyes of the fluorescein group. The dyes studied were fluorescein and a number of its nitro-derivatives. It was stated that Hewitt and Perkins (*Journal Chem. Soc.*, 1900, page 1324) claim that a double symmetrical tautomerism furnishes a satisfactory explanation for the fluorescence of fluorescein, and that in the case of dinitro- and tetra-nitro fluorescein this tautomerism is inhibited by a secondary tautomerism between the nitro and hydroxyl groups when in ortho position to each other. It was found that the mononitro-fluoresceins, obtained by condensing the 3-nitro- and the 4-nitro-phthalic anhydrides with resorcin, in which the nitro group is on a different benzol nucleus from the hydroxyl groups, show no fluorescence in alkaline solutions. According to the theory of Hewitt and Perkins alkaline solutions of such dyes should fluoresce. Photographs of the absorption spectra of alkaline solutions of the dyes were taken, and it was found that the substitution of nitro groups displaces the prominent absorption band of fluorescein towards the red end of the spectrum and increases the absorption in the ultra-violet. The absorption of light in the visible spectrum was studied by means of the flicker photometer.

The amount of light transmitted by equal thicknesses of solutions of different concentrations was measured for the different dyes. A relation was thus obtained between the absorption of light and the concentration of the dye. The work is still in progress.

F. L. TUFTS,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY OF THE NEW YORK ACADEMY OF SCIENCES.

THE first sectional meeting of the season was held on October 28, Professor Farrand in the chair. The names of Robert MacDougall and J. E. Lough were proposed for membership.

Professor J. McK. Cattell made a brief report regarding psychology at the Denver meeting of the A. A. A. S.; and Professor G. G. MacCurdy, of Yale University, reported on anthropology at that meeting, and in addition described the explorations that are being carried on in the Mesa Verde of southwestern Colorado by the Colorado Cliff Dwellings Association.

Professor Franz Boas described the facilities for anthropological study in Berlin, as observed by him in a recent visit. Within the last 20 or 30 years, the anthropological equipment of Berlin has progressed enormously. The museum now contains better East Indian collections than can be found in England; and it is strong in nearly all departments, notably so in American and especially South and Central American anthropology. Fifty scientific workers are engaged on these collections, and 16 of these are at work on American subjects. Besides the museum, there are several other institutes in Berlin, such as the Anatomical Institute of Waldeyer and the Pathological Institute of Virchow, in which anthropological work is done.

The leader of German anthropology is Virchow. He disbelieves in the study of the variation of the whole body, and insists that only the study of the variation in the individual cells of the body can lead to fruitful results.

Reports of summer field work were presented by H. H. St. Clair, 2d, on his work in Wyoming and Oregon, and by William Jones, on his work in Iowa and Oklahoma. The work of Mr. Jones was carried on among the Sauks and Foxes, a people of Algonquin stock. One band of this

people is located in central Iowa, and another in Oklahoma. Both bands practice similar customs, live in much the same way, wear the same kind of dress, show similar physical types, and, with the exception of certain differences in idiom, and with the exception that the Iowa band have a slower, more deliberate pronunciation, they speak the same tongue. The Iowa band is the more conservative, and among them the law of the clans still holds. The education of the children is accomplished not by instruction but by imitation. The older boys imitate the men, and the younger boys imitate the older ones; and similarly with the girls. The life of the children is but a smaller edition of the life of the older people. R. S. WOODWORTH,

Secretary.

TORREY BOTANICAL CLUB.

At the meeting of the Club on November 12, the first paper was by F. S. Earle, on '*Asco-corticium* in North America,' correcting the current nomenclature as to this genus, details of which will shortly appear in print.

The second paper, by Dr. Britton, 'Remarks on the Flora of St. Kitts, British West Indies,' was a sketch of his recent observations there, with copious series of herbarium sheets, and of fruits and other specimens in alcohol. Scarcely any botanical work had been done on St. Kitts previous to its exploration by Dr. Britton and Mr. John F. Cowell last summer. In all they collected about 3,500 herbarium specimens, representing perhaps half of the flora. Many tree-ferns were brought which are now making good growth, and a great number of cacti which are already on exhibit in the succulent house of the New York Botanical Garden.

Dr. Britton spoke in particular of the great interest attaching to that purely tropical flora, its aspect wholly dissimilar from that of our Atlantic coast except only in the presence of the introduced Horsetweed, *Leptilon*. St. Kitts is a volcanic mass, formed of a rugged central mountain rising to about 4,000 feet, dissected by radiating gorges which reach to the sea, and wholly surrounded by a fringe of arable land on the shore. Steep ravine-sides 300 feet deep were often completely covered with a prodigious growth of tree-ferns; there were four or five spe-

cies in the ravines and one or two more in the denser forests; some reached a height of 50 feet; another was chiefly prostrate. A good number of the filmy ferns were found; perhaps ten; and many *Gleichenias* at high altitudes, where ferns constitute the chief flora. No *Equiseta* were found; among the Lycopods, a species of *Psilotum* on tree-trunks, some large and handsome *Selaginellas*, and three *Lycopodiums* occur, of which one conspicuous species was known to the negroes as 'Staghorn.' The grasses number 30 or more, the largest a *Gynerium* known as Wild Cane or Dumb Cane. Guinea-grass, *Panicum maximum*, is the only source of hay. Sedges were few, for there is little standing water (except a littoral salt-marsh); only a little pond near a mountain summit at 3,500 feet, and a little lake in the bottom of the old crater of the volcano, Mt. Misery. *Sclerias* with saw-edged leaves were quite abundant and form an obstacle on mountain-trails.

Aroids are very conspicuous, and in great quantity, but only about eight species; two of *Anthurium*, climbing trees, two of *Philodendron*, one with perforated leaves; one *Dieffenbachia*; and a species known as Elephant's Ear, forming great masses, with leaves sometimes five feet long.

Only two palms were found, one, a *Bactris*, reaching 30 feet; two *Commelynas*; three or four *Tillandsias*; a *Dioscorea* with remarkable purple leaf, now growing in the propagating house; about sixteen orchids; and one gymnosperm, a *Podocarpus*, abundant high up, and known as 'wild rosemary tree.' Among higher plants the pepper peppers, the Papilionaceæ and allies, the *Euphorbia* and *Melastoma* families, are numerous. The Compositæ are numerous present, but chiefly as weeds; a handsome new purple-flowered *Eupatorium* was found on the top of Mt. Misery, forming a shrub, and eight to ten feet high. The alligator-pear, *Persea Persea*, is quite abundant. There are four species of *Ficus*, a wild cherry, a *Viola*, etc. A raspberry occurred in a mountain pasture at 2,000°. Among the more peculiar were the *Cecropia*, with white under surfaces of leaves, *Marcgravia* climbing appressed to trees to the height of 50 feet, and *Hillia*, interesting from its large lustrous white flowers.

The results of Dr. Britton and Mr. Cowell's expedition bid fair to prove of high economic importance aside from their scientific value. The expedition owed much to the kind assistance of the planters, who detailed their negroes and horses for the service of the explorers. Without such aid, it would have been difficult to penetrate the forest belt, through which trails had first to be cut.

Further remarks were added by Dr. Underwood regarding a dodder in tops of trees in Porto Rico; by Mr. J. H. Barnhart, on an epiphytic *Utricularia* among the specimens from St. Kitts exhibited; by Mr. F. S. Earle, on the few fungi collected; and by Mrs. Britton, on the other cryptogams, which numbered 81, and included a *Vittaria* prothallium.

EDWARD S. BURGESS,
Secretary.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 321st meeting of the Society was held on November 5. Professor W. H. Holmes read a paper on the 'Discovery of Human Relics and the Bones of Extinct Mammals in a Sulphur Spring, Indian Territory,' an abstract of which will be published in *SCIENCE*. This paper was discussed by Dr. W. J. McGee, Jos. D. McGuire, F. W. Hodge, Francis La Flesche and others.

Miss Alice C. Fletcher gave an account of 'The Inauguration of the New Department of Anthropology, University of California,' through the munificence of Mrs. Phoebe A. Hearst. For ten years Mrs. Hearst has been gathering museum material, spending fifty thousand dollars a year on its acquisition and looking forward to a time when the collections might be housed in a museum building. Last summer the project took form, resulting in the establishment of the Museum at the University of California with a handsome endowment, the details of which appeared in *SCIENCE*, October 18, 1901.

WALTER HOUGH.

DISCUSSION AND CORRESPONDENCE.

THE GEOGRAPHICAL DISTRIBUTION OF FISHES.

IN *SCIENCE* for November 1, Professor A. E. Ortmann offers some very interesting notes on

my paper (in *SCIENCE*, October 11) on the geographical distribution of fishes. On the points raised I may add a word.

1. There is little or nothing in the present relations of the fish fauna of Japan to that of the Mediterranean to suggest a former connection through a warmer climate to the northward. The forms common to the two regions are chiefly of Indian and rather deep water distribution. One curious anomaly occurs, the existence of a second species of the large trout, *Hucho*, in Japan, the other known species being in the Danube.

2. The views of Dr. Ortmann as to the faunas separated by the Isthmus of Suez and the Isthmus of Panama seem to agree with those expressed by me. Of course, from the standpoint of ichthyology, no one could say when either oceanic connection actually existed. That is a matter for geologists.

3. The fish fauna of the Cape of Good Hope is imperfectly known, that of the southeastern coast of Africa still less. It is certain, however, that some tropical or semitropical genera do pass this barrier at present. In other ages the Cape might conceivably have been less of a barrier through less extension or through warmer climate at its extremity. This again rests with the geologists.

4. I am willing to accept the theory of the former extension of the continent Antarctica on geological grounds, and the known distribution of *Galaxias* would be explained by it. But the case of *Galaxias* would not of itself prove such extension, and the value of zoological evidence in such cases is easily overestimated.

DAVID STARR JORDAN.

PREGLACIAL DRAINAGE IN SOUTHWESTERN OHIO.

TO THE EDITOR OF *SCIENCE*: In his reply (November 15) to Mr. Miller's criticism of my papers on preglacial drainage conditions in the vicinity of Cincinnati, Professor Tight should have added that every one of the smaller streams mentioned by Mr. Miller, in proof of his theory, is of *postglacial* origin and consequently has no bearing on the question.

A view up and down the Ohio from the hill-top at either Madison or Leavenworth, Indiana,

will convince any one at all familiar with such features that he is on the crest of a high watershed which has been cut through in very recent times; recent, that is, in comparison with the period of the alluvial valleys up and down the stream from his point of observation.

GERARD FOWKE.

THE SENEGAL BAOBAB TREE.

It is said by travelers that the fruit of the Senegal Baobab tree is used by the natives to curdle milk. As it is also called 'sour gourd' and cream-of-tartar tree, the curdling is probably due to an acid; and other vegetable acids are also known to be so used. But it seems that other vegetable products that are not acid will also curdle milk. In northern Mexico I was once served with a palatable dish of cooked 'cheese' that the mistress of the house told me she had herself curdled with the juice of berries, some of which she showed me. They were fruit of a *Solanum*, apparently *S. heterodoxum*. She was an intelligent woman, and spoke of that use of the berries as a common custom in Mexican families. Like other fruits of the nightshade family, they had no perceptible acid taste; and the curd which they produced had a consistence similar to that which is produced by rennet. Possibly the action upon milk of the juice of that and other non-acid fruits is similar to the action of rennet, which is thought by some investigators to be a kind of ferment.

C. A. WHITE.

SHORTER ARTICLES.

THE LARGEST DEEP-SEA FISH.

DURING the cruise of the *Albatross* in 1888 in the Pacific Ocean, a fish nearly five feet long was hauled up in a trawl cast in water of the depth of over 1,000 fathoms. Unfortunately it was thrown overboard, but happily not before a photograph was taken of it. Mr. Townsend has ever since hoped to have another chance to secure the species, but without present hope. It became desirable to make allusion to the species at this time, and he has conferred with Dr. Gill and asked to indicate its probable affinities.

The species appears to be most nearly related to *Percophis*, and for the present it may be as-

sumed that such is the case, but it is by no means certain that it is. It is deserving of the generic name *Macrias* with reference to its length as well as bulk, and the specific name *amissus* is appropriate for it as an estray from its relatives as well as to indicate the loss of the type. It is definable as follows:

MACRIAS.

A genus of Percophoid fishes with moderately oblong head, eyes in the second fourth of the head's length, slightly projecting lower jaw, thick lips, small teeth, small jugular ventrals and anal with origin behind that of second dorsal.

MACRIAS AMISSUS.

The body is elongate and between five and six times longer than high; the head forms more than a fourth ($1:3\frac{4}{5}$) of the extreme length; the caudal about a seventh. The head is oblong conical in profile, with the forehead nearly rectilinear; the eyes are in the third eighth of the length, with the diameter equal to about an eighth of that length, and nearly midway between the preoperculum and the front of the jaw; the mouth is quite oblique and the supra-maxillary extends scarcely behind the front of the eye; the teeth appear to be cardiform; the lips thick. The dorsal rays are not sufficiently defined to count exactly, but they approximate the following formula: $DXI-19$.

The specimen was obtained at the *Albatross* dredging station 2788, off Chonos Archipelago, southern Chili, S. A. (Lat. S. $45^{\circ} 35'$, Long. W. $75^{\circ} 55'$), at the depth of 1050 fathoms; bottom green mud; bottom temperature, 36° F.; surface temperature, 58° F.; from an 11-foot beam trawl, Feb. 11, 1888. The dredge haul lasted three hours.

The fish was about five feet long, and is the largest deep-sea fish taken by the *Albatross*—probably the largest ever taken by beam trawl or dredge. Its color was grayish. It had the softness of flesh characteristic of deep-sea fishes, settling down on the deck so that its natural contour does not show in the large 8 x 10 photograph that was at once made of it.

There being no receptacle available for preserving it in alcohol, it was placed in a cask and salted. Later the cask and specimen were un-

fortunately thrown overboard with some rubbish from the ship laboratory.

The exact measurements of the specimen will be given later when the photograph is reproduced by the Fish Commission.

THEO. GILL,
C. H. TOWNSEND.

CURRENT NOTES ON METEOROLOGY.

HAIL PREVENTION BY CANNONADING.

THE hail prevention cannonading craze has gone very far in Windisch-Feistritz (Steiermark), the home of this newest undertaking for artificially controlling weather phenomena. In *Das Wetter* for October Dr. Friedrich Stengel, who has recently visited the locality, gives an enthusiastic account of the somewhat remarkable arrangements which have been made for this work. The huts containing the firing apparatus are 1 km. apart, in four long parallel rows, the rows also being 1 km. apart. There are three groups of stations, containing twelve, thirteen and fifteen stations each, respectively. Each section has a central station, under the charge of a *schuessmeister*, and each *schuessmeister* is directed by the general superintendent. Cannonading begins when a thunder-storm is within two or three kilometers. Sometimes only one of the sections fires; at other times all the stations participate. Firing continues until the sky begins to clear overhead, or, if this does not happen, until thunder and lightning cease and a general rain sets in. The central station of each section regulates the time of the beginning and ending of the firing, as well as the rapidity of the discharges.

THE DUST STORM OF MARCH, 1901, AND GLACIAL STUDIES.

IN the October number of the *Meteorologische Zeitschrift*, Richter calls attention to the use that may be made of the fall of red dust which occurred over most of Europe on March 11 last. It was suggested some time ago that studies of glacial movements and phenomena might be facilitated by coloring a considerable portion of the surface of a glacier, and then noting the rapidity of movement, and the folding and fracturing of this particular colored stratum. The dust storm of last March colored the Euro-

pean glaciers on a grand scale, and thus an excellent opportunity of making critical studies of these glaciers has been provided, which could never have been brought about by artificial means.

THE CLIMATIC CONTROL OF GOVERNMENT IN THE TROPICS.

MR. W. ALLEYNE IRELAND, who is well known in this country through his writings on the settlement and government of tropical possessions, read a paper on the influence of geographical environment on political evolution before the British Association at its Glasgow meeting. In this paper the possibilities of native government within the tropics are discussed. The conclusion is reached that while the natives of the tropics are not deficient in intellectual power, their 'climatic discipline' renders them unfitted to play the part of legislators or responsible administrators, or to maintain a government sufficiently stable to admit of proper commercial development.

UNDERGROUND TEMPERATURES AT OXFORD.

THE volume containing the meteorological observations made at the Radcliffe Observatory, Oxford, from 1892 to 1899, presents some notable facts regarding soil temperatures. The observations were made with platinum resistance thermometers, placed at various depths. The thermometers on the whole were found to work much more satisfactorily than the common spirit thermometers with long stems. It appears that the annual variation in temperature is reduced to 0.1° at a depth of 45.3 ft., and to 0.01° at 66 ft. The semi-annual wave has these same limits at 21.4 and at 36 ft., respectively.

R. DEC. WARD.

BOTANICAL NOTES.

IMPORTANT PHILIPPINE WOODS.

UNDER this title Captain George P. Ahern, of the Ninth Regiment of United States Infantry, has issued a small quarto volume of 112 pages, illustrated with forty-two colored plates. The author, who is in charge of the Forestry Bureau at Manila, candidly states that it is a compilation undertaken in response to numer-

ous inquiries concerning the Philippine forests. In its preparation he has made use of the works of Blanco, Vidal, Delgado and Garcia. The translations are rather awkward, indicating a lack of botanical knowledge on the part of the translator. The plates are mainly from Blanco's 'Flora de Filipinas' and Vidal's 'Sinopsis de Familias y Generos de Plantas lenosas de Filipinas.'

More than six hundred species of trees are now enumerated for the archipelago, and it is estimated that there are from twenty to forty millions of acres of forests still standing, in which there are in many places trees one hundred and fifty feet in height. Gum, rubber, gutta percha and dye-producing trees occur in abundance, as also those producing timber, firewood, textiles, oils, tan-bark, medicines and edible fruits.

In many cases these forests are at present inaccessible on account of the lack of waterways and good roads. The methods of the natives are crude, slow and expensive. When good roads are made and better methods are introduced the islands will be able to supply a large amount of timber for construction, for which there is a great demand throughout the Orient.

RECENT ECOLOGICAL PAPERS.

THREE recent papers are noted here, the first of which is by Professor Doctor Bray of the University of Texas, on the 'Ecological Relations of the Vegetation of Western Texas,' published in the August, September and October numbers of the *Botanical Gazette*, in which the author points out the fact that the region is the meeting ground of no less than eight floral elements, and that the flora is one of xerophytic aspect. Excellent half-tone illustrations add much to the clearness of the text. The second paper is by A. J. Pieters, assistant botanist in the United States Department of Agriculture, on 'The Plants of Western Lake Erie,' in the *Bulletin* of the United States Fish Commission. Here it is shown that the vegetation may be grouped as follows: (1) Free-swimming, microscopic forms in the open lake—i. e., the plankton; (2) other unattached species, mainly macroscopic, as *Lemna utricularia*, etc.; (3) attached submersed plants, as *Najas*, *Chara*, *Cladophora*, etc.; (4) attached plants with floating leaves, as

Nymphaeaceae and *Potamogeton*; (5) swamp plants. Here again excellent half-tone illustrations are used with good effect. The third paper is by Thomas H. Kearney, of the Division of Botany of the United States Department of Agriculture, on a botanical survey of that very interesting region, the Dismal Swamp of southeastern Virginia. After a discussion of such factors as climate, physiography, geology and soils, the plant covering is described at length, and the conclusion is reached that of the indigenous species (about 620) 'over five hundred are endemic in extra tropical North America, the great majority in the country east of the Rocky Mountains.'

GOVERNMENT GRASS STUDIES.

THE Division of Agrostology was established in the United States Department of Agriculture in 1895 for the purpose of investigating the various problems relating to the grasses and forage plants of the country. After six years of existence a bulletin has been issued presenting a summary of the work accomplished, under the title of 'Field Work of the Division of Agrostology,' and prepared by Cornelius L. Shear. Maps show at a glance the territory covered by the various field workers, and no botanist can examine these without gratification that so much has been done in half a dozen years. The greatest amount of work has been done in the Gulf States from Florida to Texas, thence northward over the Great Plains and the eastern Rocky Mountain region to the international boundary. Twenty-seven different botanists have been engaged in these field studies.

In the Atlantic coast states the investigations included, in addition to the usual one of forage, the study of grasses as sand-binders, and much attention was given to this part of the subject. In the States of the Gulf coast the forage problems are more difficult of solution, the soil having been exhausted in many places, and the people having the impression that grasses for forage purposes cannot be grown here as well as in the North. The fact that between 300 and 400 species grow naturally in this region disproves the latter, and the results of experiments show

that on almost any soil some grasses may be grown with profit. On the Great Plains, although the region is so vast, the problems are less varied, since the conditions are more nearly similar throughout. Here to a great extent the problem is the preservation of the natural pastures and meadows, and their renovation where they have been injured by overpasturing or by the plow. Over a great part of this region the natural meadows should be allowed to remain, and the plow should not be permitted to disturb the well-set sod. In the Rocky Mountains the conditions are extremely varied, and the problems are accordingly more numerous. In many places the natural meadows must be preserved, while in others, as under irrigation, grasses especially suited to the new conditions must replace the scanty growth which preceded them. A new problem obtrudes itself here, viz., that of forage plants for the 'alkali soils.' The problems in the Northwest include the last mentioned (apparently solved by the growth of species of *Atriplex*), and the renovation of the natural pastures which have been overstocked. In the Southwest some interesting facts are brought to light, as that as soon as the prairie fires are stopped the mesquite tree (*Prosopis*) and the prickly pear cactus (*Opuntia*) increase very rapidly, while at the same time the extermination of the coyotes allows the rabbits and prairie dogs to increase to such a degree as to make them most serious pests. On the Pacific coast the work has included the problem of the control of shifting sands in addition to studies of pasture and meadow grasses.

In the course of these investigations much valuable material for scientific study has been obtained, and great quantities of seeds of the more important species have been secured for distribution and trial elsewhere in the country. Above forty bulletins have been issued by the division, ranging from quite popular to technically scientific. No one can look over the work done, as indicated in this bulletin, and not feel that Secretary Morton did a good thing when he established the Division of Agrostology, and that it has fully justified its existence.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

THE SOUTH AFRICAN MUSEUM.

THE report of the South African Museum for 1900 may be styled a record of good work performed under adverse conditions, for the war in South Africa has affected the museum in more ways than one, lessening not only the number of contributors to the collections, but the number of visitors. This falling off is the first break in a steady increase that has been going on for a considerable period. The accessions of vertebrates have been principally of birds, but one example of the young of the rare cat *Felis nigripes* was obtained in a rather curious way, it having run into the trenches at Zand River during a hot engagement.

Two of the contributors to the museum, Mr. Walter Francis and Dr. A. C. Stark, have been killed during the war; the latter was engaged in the preparation of a work on the birds of South Africa, the first volume of which had appeared. The second volume has been completed by the director, Dr. W. L. Selater, and is now in press. Dr. L. Peringuey has sent to the printer the first part of a descriptive catalogue of the *Scarabeidæ*, and states that the manuscript of the second part is well advanced. The second volume of the *Annals* of the museum is well along and all the collections are said to be in good shape, and we hope with Sir David Gill that the time may soon come when it will be possible to increase the small appropriation made for the maintenance of this museum.

F. A. L.

SCIENTIFIC NOTES AND NEWS.

DIRECTOR W. W. CAMPBELL, of the Lick Observatory, was elected a foreign associate of the Royal Astronomical Society at the meeting of November 9.

MR. ALEXANDER AGASSIZ, accompanied by Mr. W. McM. Woodworth, has undertaken an expedition to the Maldivé Islands in the Indian Ocean, in order to study the coral formations. A steamboat for this purpose has been chartered at Ceylon.

PROFESSOR F. LAMSON SCRIBNER, chief of the Division of Agrostology of the United States Department of Agriculture, has been given charge of the Bureau of Agriculture which is to

be organized in the Philippines. Professor Lamson-Scribner will sail for the Philippines with his family on February 1.

MR. EDWIN REYNOLDS, of Milwaukee, has been elected president of the American Society of Mechanical Engineers.

DR. JOSEPH LARMOR, lecturer in mathematics in Cambridge University, has been nominated by the council as junior secretary of the Royal Society.

PROFESSOR WILLIAM B. SCOTT, Blair professor of geology at Princeton University, has returned from his visit to the Argentine Republic, where he spent six months in investigations preparatory to his work in publishing the reports of the Princeton Patagonian expeditions.

PROFESSOR E. W. MORLEY, professor of chemistry in Adelbert College, has returned from Paris, where he went to be present at the International Conference of Weights and Measures during October.

DR. MAXWELL SOMMERVILLE, professor of glyptology in the University of Pennsylvania, has returned from an expedition to the Orient. He has brought with him valuable collections, which will soon be added to the great collection which he presented to the museum several years ago.

D. I. BUSHNELL, JR., has returned from St. Louis, where he explored a number of small mounds in that part of Forest Park that is to be occupied by the Fair in 1903. A knowledge of them is thus secured before their total destruction.

AN oil portrait of Dr. Edward G. Janeway was unveiled at the anniversary meeting of the New York Academy of Medicine on November 26. An address was given by Dr. R. H. Fitz, of Harvard University, whose subject was 'Some Surgical Tendencies from a Medical Point of View.'

DR. HERMAN STRECKER, a sculptor and entomologist, died at his home at Reading, Pa., on November 30, aged sixty-five years. Dr. Strecker was the author of a work on 'Native and Exotic Butterflies and Moths,' and owned a collection, said to contain 375,000 specimens.

THE little son of Professor T. D. A. Cockerell died at East Las Vegas from diphtheria on November 25. Though only eight years old, he had made a number of little discoveries of his own. Thus he discovered the larva of *Picris occidentalis*, and raised the butterfly. He also found the first psocid recorded from New Mexico, and collected at least three new insects: a new bee of the genus *Epeolus*, described by Professor Cockerell; a new meloid beetle, now in the National Museum, not yet described; and a new grasshopper of the genus *Melanoplus*, described by Mr. Scudder, and about to be published.

SIR WILLIAM MACCORMAC, the eminent British surgeon, died on November 4, at the age of sixty-five years.

M. GUILLAUME TIBERGHEN, for fifty years professor of philosophy in Brussels University, died on November 28, aged eighty-two years.

THE death is also announced of Dr. Federico Horstman y Cantos, for forty years professor of anatomy in, and for a long time dean of the Medical Faculty of, the University of Havana.

AN examination will be held on January 21, to fill the position of assistant in the Division of Entomology, U. S. Department of Agriculture, at a salary of \$1,200 a year. The chief subject is the economic entomology of the orchard.

THE executive committee of the trustees of the Washington Memorial Institute met at Washington on December 7.

AT a meeting of the council of the Royal Society on November 7, the following resolution was passed: "That in the opinion of this council it is desirable that the secretaries should not be so re-elected as to hold office for a period exceeding ten consecutive years, this resolution not to apply to the present holders of office." A memorial supporting this resolution was signed by 130 fellows, a counter-memorial having the support of less than thirty.

THE twenty-fifth general meeting of the American Chemical Society will be held at Houston Hall, University of Pennsylvania, Philadelphia, Pa., December 30 and 31, 1901. The opening session will be called to order at 10 a. m., Monday, December 30. The visiting

chemists will be welcomed by Dr. J. Merritt Matthews, chairman of the Philadelphia Section; the provost of the University of Pennsylvania, and a representative of the City Government. President F. W. Clarke will address a few words in response. The remainder of the forenoon will be devoted to the reading and discussion of papers and general business. In the afternoon there will be visits to points of special interest under the direction of the local committee. In the evening the address of the retiring president will be delivered at the Acorn Club, 1618 Walnut Street, after which a reception will be given to the members of the Society and their ladies. On Tuesday, a session of the Society will be held in the forenoon. The afternoon will be devoted to visits and excursions, and in the evening there will be a subscription banquet. A meeting of the council will be held at such time and place as may be appointed by the president. The local committee expects to arrange a 'smoker,' if there is opportunity to do so. The committee has not been able to secure special transportation rates, but those who expect to attend may avail themselves of the regular holiday rates which prevail on some of the roads during this season.

DIRECTOR W. W. CAMPBELL, of the Lick Observatory, made public the following report on December 6: "On account of unfavorable conditions observations of the interesting nebula surrounding the new star in Perseus were not obtained for several weeks. The clear sky of last night, just preceding to-day's storm, was taken advantage of by Professor Perrine to secure a photograph of it with the Crossley reflector, exposure five and a half hours. The extraordinary motion in the nebula, discovered by him on November 10 and confirmed by Ritchie, of Yerkes Observatory, on the day following, continues unchanged for the two principal condensations. They have moved outward certainly more than half a minute of an arc in the last three weeks. The third condensation has greatly changed its form, but nevertheless its motion outward appears to continue. The strong mass of nebula nearest the star seems to remain unchanged, both in position and appearance."

A PEARSON CLUB has been organized recently by members of the faculty of the University of California for the discussion of fundamental problems of science suggested by Karl Pearson's 'Grammar of Science.' The membership of sixteen includes representatives from the departments of biology, geology, mathematics, philosophy and physics.

A DESPATCH to the London *Times* from Littleton, New Zealand, states that the National Antarctic Exploration ship *Discovery* arrived here November 29. All on board were well and in good spirits. They state that they entered the pack-ice in lat. 63.5 and long. 141 E., but pressure of time prevented a thorough investigation of the ice. Interesting collections were, however, made during the voyage. A party landed on Macquarie Island for a few hours, obtaining some live penguins, some eggs and some seals. The *Discovery* has been dry-docked for caulking, having sprung a leak, though not a serious one. When the *Discovery* continues her voyage, which will probably be in a fortnight, she will take with her a supply of meat presented by the Canterbury stock farmers.

THE Liverpool School of Tropical Medicine has sent a special expedition under Dr. Charles Balfour Stewart, to the Gold Coast and to the gold-mining districts of that colony, to conduct a series of operations there with a view to improving the conditions of health and sanitation.

THE Russian Pharmaceutical Society, Moscow, has celebrated with appropriate ceremonies the two-hundredth anniversary of the opening of the first free pharmacy in Russia.

THE courts have decided in favor of the ruling of the Treasury Department, which excluded an Irish immigrant suffering from tuberculosis.

THE egg of the great auk continues to bring a large price whenever chance brings one into the market, and the last was sold at the noted auction rooms of J. C. Stevens, London, for 240 guineas. This egg was the last of four owned by the late Baron D'Hamonville, and was peculiarly marked with inky lines and blotches. It was purchased by Mr. Massey, who some years ago paid the record price, 315

guineas, for what is thought to be the best egg of the great auk extant.

THE large tusk of an African elephant, recently noted in SCIENCE as having been purchased by the British Museum, is said to be one of the two shown by Messrs. Tiffany & Company at their rooms in New York. These tusks, whose measurements and weight were given in SCIENCE and have also been noted in Mr. Lucas's 'Animals of the Past' will probably continue to hold the record for elephant tusks.

PRESIDENT FRANCIS, of the Louisiana Purchase Exposition Co., states that the "Washington University site will be enclosed within the limits of the fair grounds, and all the new buildings will be used for the purposes of the exposition. The university grounds comprise about 110 acres, and upon them have been erected during the past two years educational buildings which have cost approximately \$1,000,000. None of these buildings is yet completed, but all now in course of construction will be finished within the next six months. The exposition company will give liberal compensation to the University for the use of its grounds and buildings, but the entire consideration for such use will be put into the erection of additional buildings, and into the embellishment of the grounds for the use of the exposition, thus affording unparalleled advantages for an educational exhibit."

AT the meeting of the Zoological Society of London on November 19, Professor E. Ray Lankester, F.R.S., read a memoir on the new African mammal *Okapia johnstoni*. After an account of the history of the discovery of this remarkable animal by Sir Harry Johnston, Professor Lankester gave a description of its skull and skin, based upon the specimens forwarded to the British Museum by the discoverer, and compared its structure with that of the giraffe and the extinct member of the same family, *Helladotherium*. The nearest living ally of the Okapi was undoubtedly the giraffe. Mr. Oldfield Thomas read a paper on the five-horned giraffe obtained by Sir Harry Johnston near Mount Elgon. It was shown that, although the horns were unusually developed, the animal could not be specifically separated from the North-African giraffe, *Giraffa camelopardalis*.

This latter was believed to grade uniformly in the development of the horns and other characters into the South African form, which would therefore be only a subspecies, *G. c. capensis*. On the other hand, de Winton's *G. c. reticulata* (from Somaliland) seemed to be sharply separated, and therefore to be worthy of recognition as a distinct species, *G. reticulata*. With regard to the accessory horns, it was shown that they, or rudiments of them, existed in all male giraffes, even in the southern subspecies.

THE Davenport Academy of Sciences has arranged a course of popular scientific lectures as follows:

January 4—'The Snake Dance of the Mokis': DR. J. WALTER FEWKES, Bureau of Ethnology, Washington, D. C.

January 11—'The Degenerates of Animal Society': PROFESSOR HENRY B. WARD, The University of Nebraska.

January 18—'The Glacial Period in Iowa': PROFESSOR SAMUEL CALVIN, The State University of Iowa.

January 25—'Some Remarkable Members of an Ancient and Highly Distinguished Family': PROFESSOR THOMAS H. MACBRIDE, The State University of Iowa.

February 1—'The Aztecs of Ancient Mexico': PROFESSOR FREDERICK STARR, The University of Chicago.

—'The Bottom of the Sea': PROFESSOR C. C. NUTTING, The State University of Iowa.

UNIVERSITY AND EDUCATIONAL NEWS.

MR. ANDREW CARNEGIE has offered to give \$10,000,000 to the United States for the purpose of establishing in Washington a national university.

MRS. JANE L. STANFORD completed the transfer to Leland Stanford Junior University, on December 9, of property, consisting of stocks, bonds and real estate, said to be worth approximately \$30,000,000.

MR. JOHN D. ROCKEFELLER has offered to give Bryn Mawr College \$230,000 for the erection of a new dormitory building and a central heating and electric light plant, conditional upon the trustees of the College being able to secure by commencement day, in June, 1902, pledges for the additional sum of \$250,000 needed for a library building. The authorities of the College are taking steps toward raising

the required sum, and President Thomas has already received pledges amounting to \$40,000.

THE University of Pennsylvania has received \$25,000 from Messrs. Keasbey and Mattison for the new medical laboratories, and \$5,000 from Mr. John F. Wentz for the engineering department.

TUFTS COLLEGE receives \$50,000 by the will Mary F. Stearns. The Tuskegee Institute, the Hampton School and Berea College are to divide \$50,000 and the residuary estate.

MR. CARNEGIE promised recently to subscribe £25,000 to the building fund of the Glasgow Technical College on condition that an equal sum was raised from other sources. At the last meeting of the council the chairman announced that he had received two anonymous donations of £25,000 and £10,000 and other sums, making a total of £44,000. The fund, including Mr. Carnegie's subscription, now amounts to nearly £170,000.

THROUGH the generosity of the Frazer family a fellowship in physics (value \$10,000) has been established in the University of Pennsylvania in honor of John Fries Frazer, former professor of natural philosophy in that institution. This fellowship as well as the Hector Tyndale Fellowship in the same subject are now open for application.

THE Thaw fellowship in astronomy at Princeton University, carrying \$500 a year and open to any graduate of not more than five years' standing from an accredited American college, becomes vacant at the close of the present academic year. Applications for it should be sent in before the first of May, addressed to the professor of astronomy.

THE dedication of Cunningham Hall and the Van Wormer Library of the University of Cincinnati will take place in the spring. The building of the Technical School is nearing completion.

THE registration at Harvard University this year and last is as follows :

	1900.	1901.
Harvard College.....	1992	1983
Lawrence Scientific School.....	507	549
Graduate School.....	341	312
Total arts and sciences.....	2840	2844

Divinity School.....	28	37
Law School.....	648	627
Medical School.....	605	506
Dental School.....	126	105
Veterinary School.....	18	...
Bussey Institution.	33	32
Total professional schools.....	1457	1308
Total University.....	4288	4142

There is thus an increase of 42 students in the Lawrence Scientific School, but a decrease in the other departments, except the Divinity School. The decrease in the Medical School is explained by the fact that this year the bachelor's degree or its equivalent is required for entrance. To the above figures should be added, in order to represent the entire university influence, the following :

	1900.	1901.
Summer schools.....	987	982
Radcliffe College (regular).....	323	334
Radcliffe College (special).....	126	116
Total teachers.....	496	487
Administrative officers.....	97	97
Total University influence.....	6317	6158

To the academic staff of the University of Cincinnati have been added :

C. W. Marx, C.E. (Washington Univ.), recently professor of mechanical engineering in the University of Missouri, professor of mechanical engineering and director of the Technical School.

C. H. Judd, A.B. (Wesleyan), Ph.D. (Leipzig), recently professor of experimental psychology, New York University School of Pedagogy, professor of psychology and pedagogy.

J. E. Ives, Ph.D. (Clark), instructor in physics.

J. F. Snell, A.B. (Toronto), Ph.D. (Cornell), recently assistant in the U. S. Department of Agriculture, instructor in chemistry.

L. L. Waters, A.M., Ph.D. (Columbia), instructor in chemistry.

J. M. Prather, A.B., A.M. (Harvard), Ph.D. (Chicago), recently assistant in Biological Laboratory of the University of Chicago, instructor in biology.

Wm. Osborn, A.M., instructor in biology.

D. T. Wilson, M.A. (Vanderbilt), recently instructor in astronomy in the University of Chicago, instructor in astronomy.

A. B. Griggs, B.S., C.E., instructor in civil engineering.

S. S. Bassler, lecturer on meteorology.